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## Port Enhancement Analysis

### Phase I:

#### Port Workload Requirements for the Ports of Seattle, WA and Tacoma, WA



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## INTRODUCTION

This is Phase I of a two-phase study.

- ◆ Phase I identifies the quantity of cargo DOD plans to send through the seaport, and
- ◆ Phase II considers the ports' ability to handle their assigned workload.

The Military Traffic Management Command's Transportation Engineering Agency (TEA) has analyzed ports for years. With our Ports for National Defense Program, we survey the ports that are important to national defense, defining their capabilities. We then compare these capabilities to the demand imposed by a notional unit deploying through the port. From this, we assess the port's ability to meet its requirements. This methodology has suited us well in the past. However, as the deployment windows continue to shrink, we are forced to get our CONUS-based deploying forces through the ports faster than ever before. Compound this with the continued economic expansion in many of these areas, and it is becoming a challenge for the ports to dedicate real estate and facilities to respond to our requirements. This is particularly true in the early days of a contingency.

As a result, TEA realized the need for a more precise assessment of each port's ability to meet its requirements. We realized the need to base each port's requirements on the most demanding operation plan (OPLAN) for that port. Using our modeling capability, we can



*Port of Tacoma*



*Port of Seattle*

work with the tremendous quantity of information in an OPLAN time-phased force deployment data (TPFDD), massage the data, and extract the detail needed to get an accurate picture of the deployment through each port.

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# **OBJECTIVES**

The objectives of this initiative are:

### **Phase I:**

- (1) Define the OPLAN-based time-phased flow of cargo through the port during a demanding deployment. This flow is defined in terms of quantity and square feet.
- (2) Allow planners to assign Transportation Terminal Brigades/Battalions (TTBs) to ports based on workload.
- (3) Allow TTBs to adequately prepare for deployment operations.
- (4) Validate the need for deploying units to support Sea Ports of Embarkation (SPOEs).

### **Phase II:**

- (1) Assist the port commander in quantifying real estate and facility support needed from the port.
- (2) In instances where the port cannot meet their requirements, provide the quantitative basis to help both DOD and commercial planners assess potential “fixes.” These fixes could include:
  - Re-routing cargo to another port in the region,
  - Re-timing the flow,
  - Working through the local and metropolitan planning organizations to solicit federal funds, or possibly even
  - Identifying areas where dollars could potentially be applied.

## DRAFT

## METHODOLOGY

When practical, ports are analyzed on a regional basis. This allows planners to examine an entire region at one time, evaluating peaks and valleys at groups of neighboring ports. In this case, the Ports of Seattle and Tacoma are both represented in the time-phased force deployment data (TPFDD). Therefore, they are both considered in this analysis.

The following tools are utilized to analyze port workload:

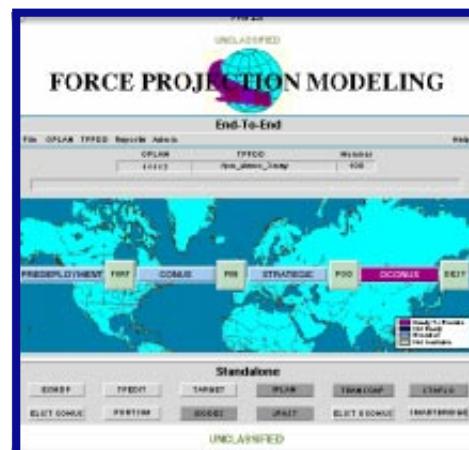
**TPEDIT (TPFDD Editor)** – An integrated set of automated processing tools that provides TPFDD editing and analysis capability. TPEDIT allows the analyst to:



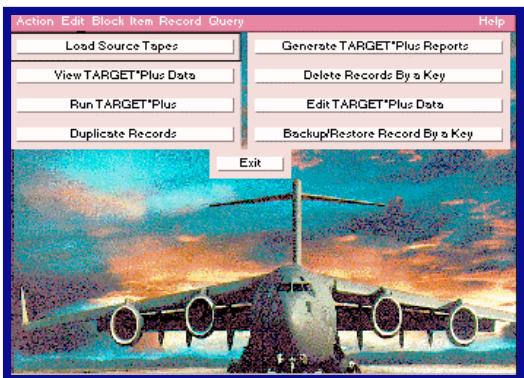
- ◆ View the TPFDD graphically.
- ◆ Extract information for the seaport of embarkation (SPOE) of interest.
- ◆ Edit the TPFDD. Remove “on-call” and “shortfall” records. Clean up data issues.
- ◆ Review data to determine the amount of cargo (number or ULNs/CINs, quantity, square feet, short tons, measurement tons) flowing through the port.

**EXPANDED TPFDD** - A database shared by the simulation models and used for tracking movement requirements at the individual item level of detail. Using the Expanded TPFDD the analyst can:

- ◆ Load the TPFDD into the Oracle database management system.
- ◆ “Expand” the TPFDD cargo detail within Oracle to Level 6 for the SPOE of interest.



## DRAFT



**TARGET (Transportability Analysis Reports Generator)** – A system of models and programs that provide the capability to generate movement requirements at the individual item level of detail (Level 6). The system merges force structure data from the Table of Organization and Equipment (TOE) or the Modified TOE (MTOE) with equipment characteristics from the Department of the Army Standard Equipment Characteristic File (ECF) to create unit equipment tables. With TARGET, the analyst:

- ◆ Assigns transport modes by ULN/CIN (convoy/rail).
- ◆ Selects transport assets.  
[Containers \(20' and 40'\)](#)  
[Railcars \(89' flatcars, 60' flatcars, 68' DODX railcars\)](#).
- ◆ Determines convoy, rail, and container requirements.

**FPM REPORTS** – A set of customized reports extracts detailed cargo information from TARGET output files. These reports, when imported into Microsoft Excel, are the foundation of the port workload effort. The graphs are included in the results section of this report.

## **ASSUMPTIONS**

- ◆ The requirements in this report represent:
  - The entire duration of the flow through the ports of Seattle and Tacoma as defined by the operation plan (OPLAN).
  - All records in the plan scheduled to move by sea under Military Sealift Command's (MSC) control.
  - The most demanding plan for each port. The plans may not necessarily be representative of the flow during an actual deployment.
- ◆ TPFDD Records not included in this analysis:
  - “On-call” records. These records are in the plan but are not scheduled to move – they appear with an available to load date (ALD) of 999.
  - “Shortfall” records. These records are in the plan but are not sourced – they have not been matched with a specific unit.
  - Bulk petroleum, oils, and lubricants (POL) records (packaged POL is included).
- ◆ TARGET uses the following transport assets:

Containers (20-foot, 40-foot)

Convoy Vehicles (self-propelled, towed)

Railcars (89-foot flatcars, 60-foot flatcars, 68-foot DODX railcars)

**NOTE:** Commercial Motor was not utilized

- ◆ Containers are stuffed at their origin.
- ◆ TARGET stuffs containers and loads railcars with unit integrity. In addition, TARGET will not mix unit equipment and containers on the same railcar. This provides a conservative estimate of containers and railcars for each unit.
- ◆ If the origin is less than 400 miles from the seaport of embarkation (SPOE), roadable vehicles convoy from origin to SPOE. If the origin is greater than 400 miles from the SPOE, roadable vehicles are loaded onto railcars for transport to the SPOE. All nonroadable vehicles are loaded onto railcars for transport to the SPOE.
- ◆ The breakbulk category includes cargo coded in the TPFDD as containerizable with dimensions exceeding the allowable dimensions of a 20-foot container and nonvehicular cargo coded as noncontainerizable.

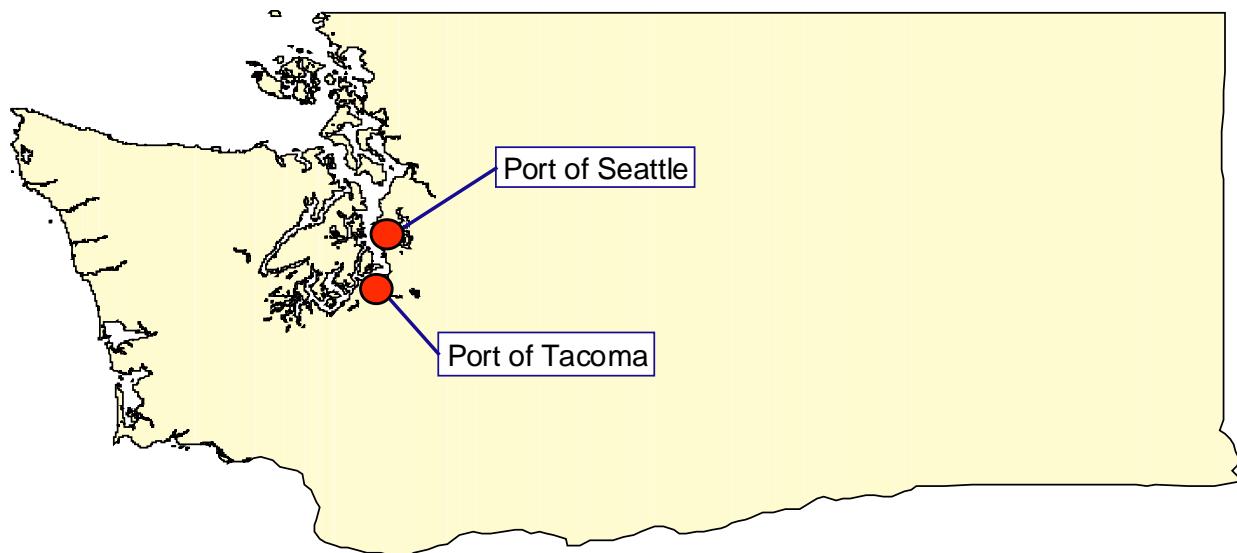
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## RESULTS

The results of this analysis for the Ports of Seattle and Tacoma (Figure 1) are in Appendix A and B, respectively. The graphs in each appendix represent the cargo arriving at that port, as outlined in the TPFDD. Since "vehicles" is such a broad category it is divided into categories as outlined in Table 1.

Table 1  
Categories of Vehicles

	Wheeled Vehicles	Tracked Vehicles
Light	Less than 5 ST	Less than 20 ST
Medium	5-30 ST	20-35 ST
Heavy	Greater than 30 ST	Greater than 35 ST



*Figure 1. Seaports of Interest in Washington*

## APPENDIX A

### Port of Seattle

According to the TPFDD, there are fourteen origins sending cargo to the Port of Seattle (Figure A-1). This cargo is a mix of Army, Navy, Air Force, Marine Corps, and Joint sustainment cargo. Since all of the origins are in excess of 400 miles away, all of the cargo is arriving at the Port of Seattle by rail. Figures A-2 through A-4 show the quantity of transports (containers and railcars) required to move cargo to the Port of Seattle.



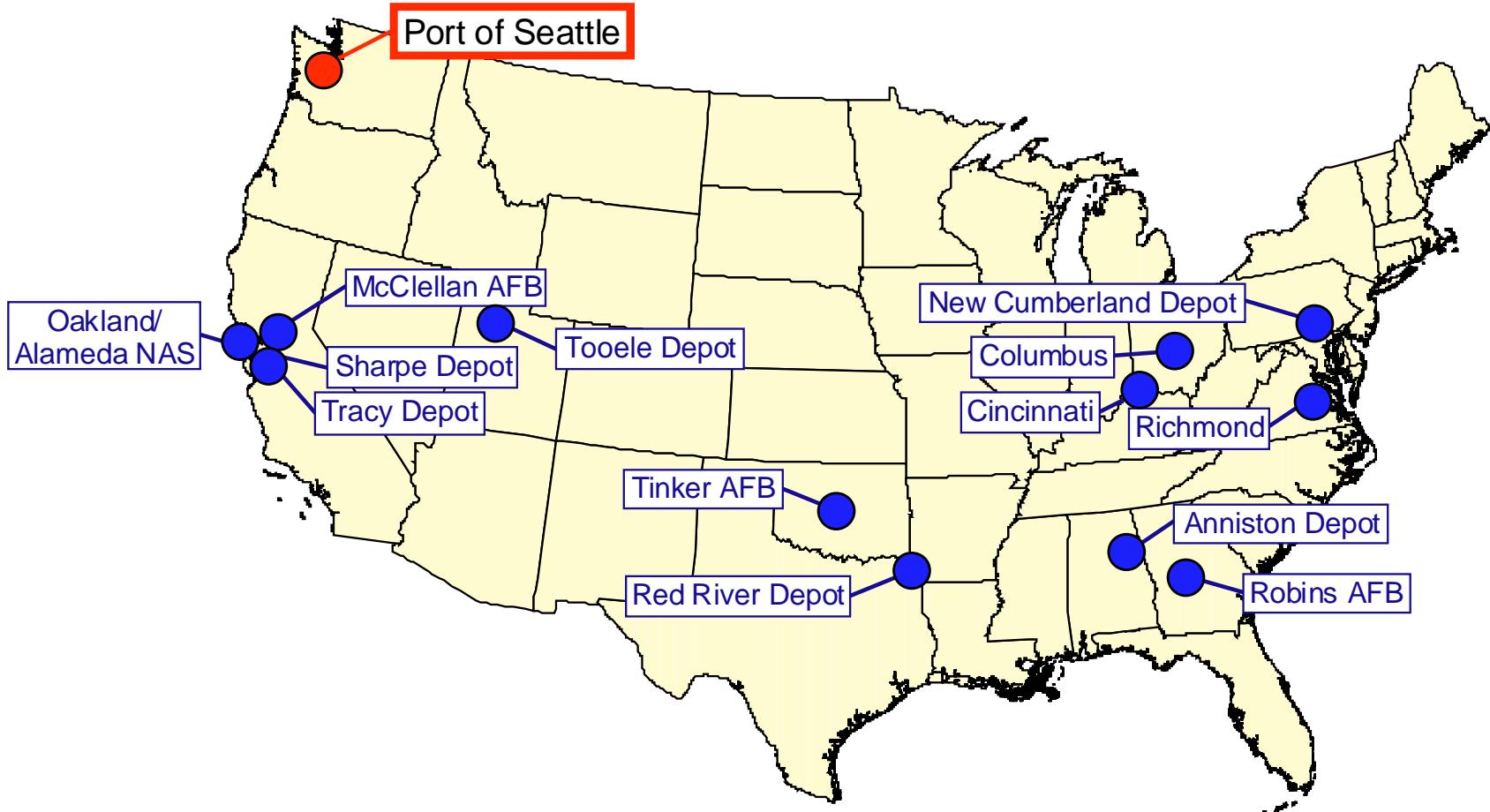
Figures A-5 through A-8 illustrate the quantity of items arriving at the port. Figure A-5 is the total quantity of items. Figures A-6 through A-8 break this down into more detail. Figure A-6 is the quantity of vehicles. Normally, vehicles are broken into categories. However, based on the details given in the TPFDD, there is no way to determine if these are wheeled or tracked vehicles, much less specific vehicle identification. Therefore, for this report they are simply categorized as “vehicles.” Figure A-7 gives the quantity of containers arriving at the Port of Seattle. These are standard eight-and-one-half-foot high twenty-foot containers that TARGET has stuffed with small pieces of containerizable equipment. The remaining items, shown in Figure A-8, are either (1) too large to fit inside a container or (2) considered “not containerizable.”

Similar to Figures A-5 through A-8, which lay out the quantity of items arriving, Figures A-9 through A-12 outlines the square footage of these categories of cargo.

As shown earlier, cargo arrives at the Port of Seattle from fourteen distinct origins. Figure A-13 shows visually the amount of cargo coming from each origin.

Figures A-14 and A-16 show the quantity and square footage, respectively, of cargo arriving at the Port of Seattle by origin. Figure A-15 is the quantity of containers arriving at the Port of Seattle from each origin.





*Figure A-1. Cargo Arrives at the Port of Seattle from Many Origins*

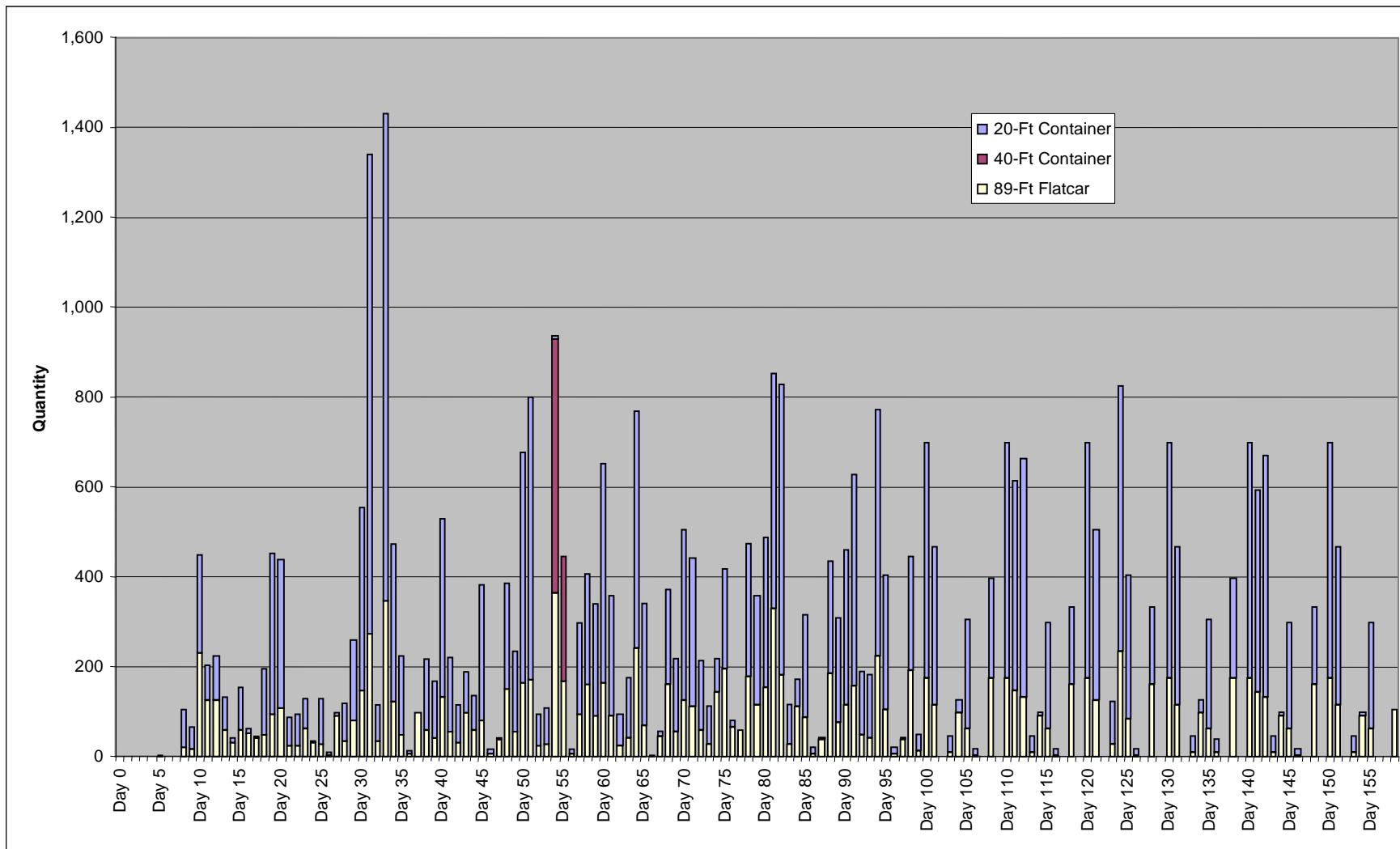


Figure A-2. Total Quantity of Transports Arriving at the Port of Seattle

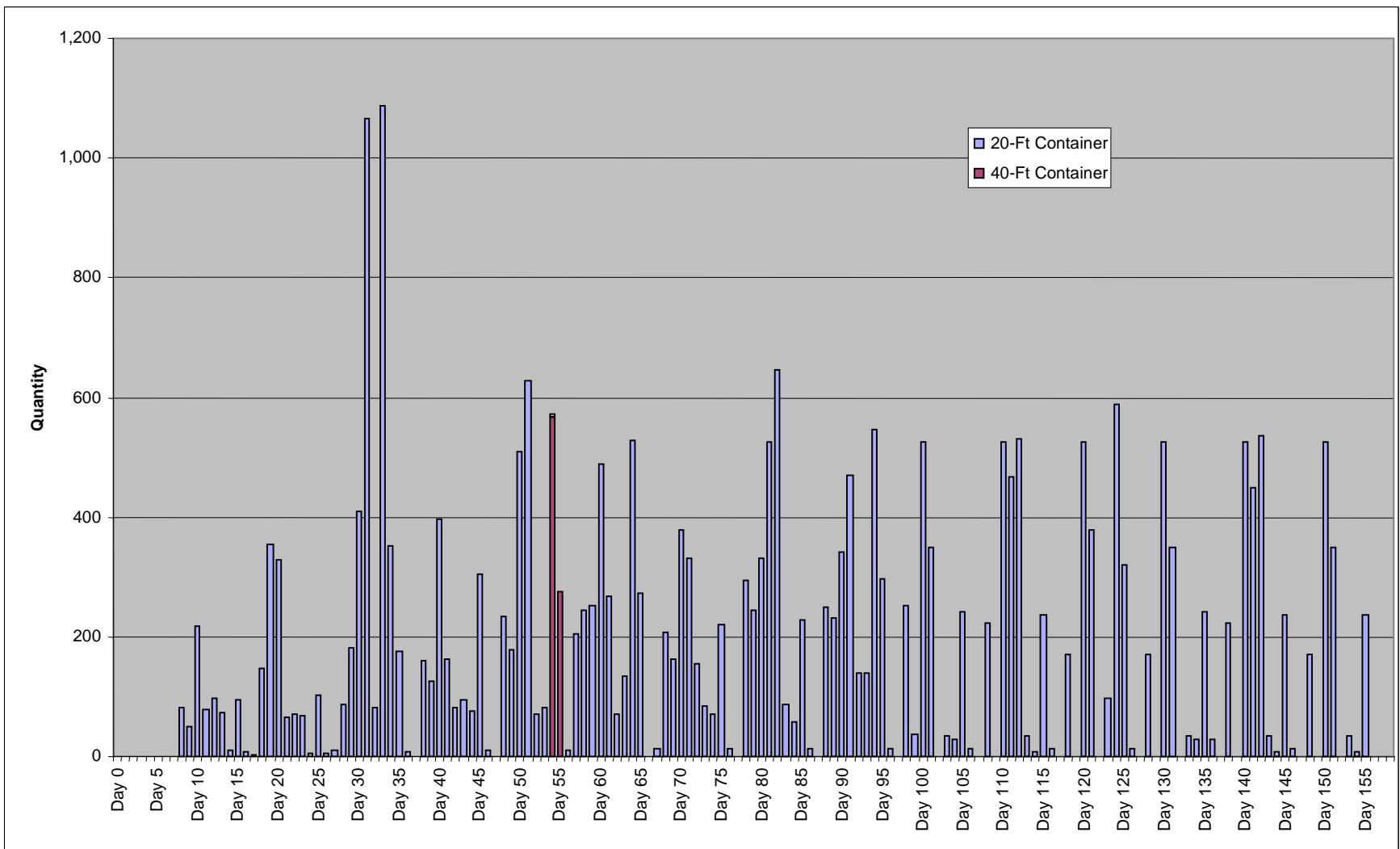


Figure A-3. Quantity of Containers Arriving at the Port of Seattle

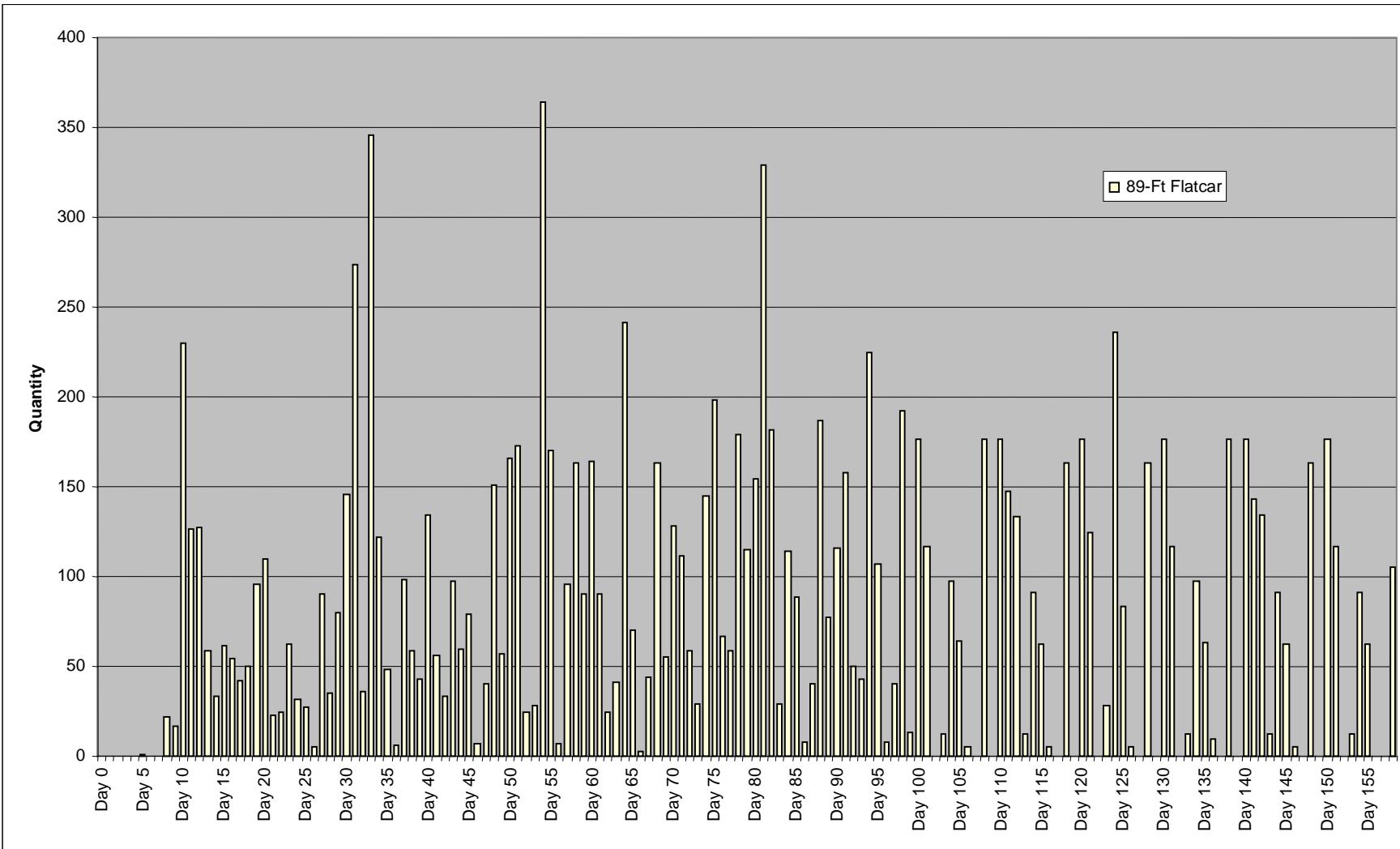


Figure A-4. Quantity of Railcars Arriving at the Port of Seattle

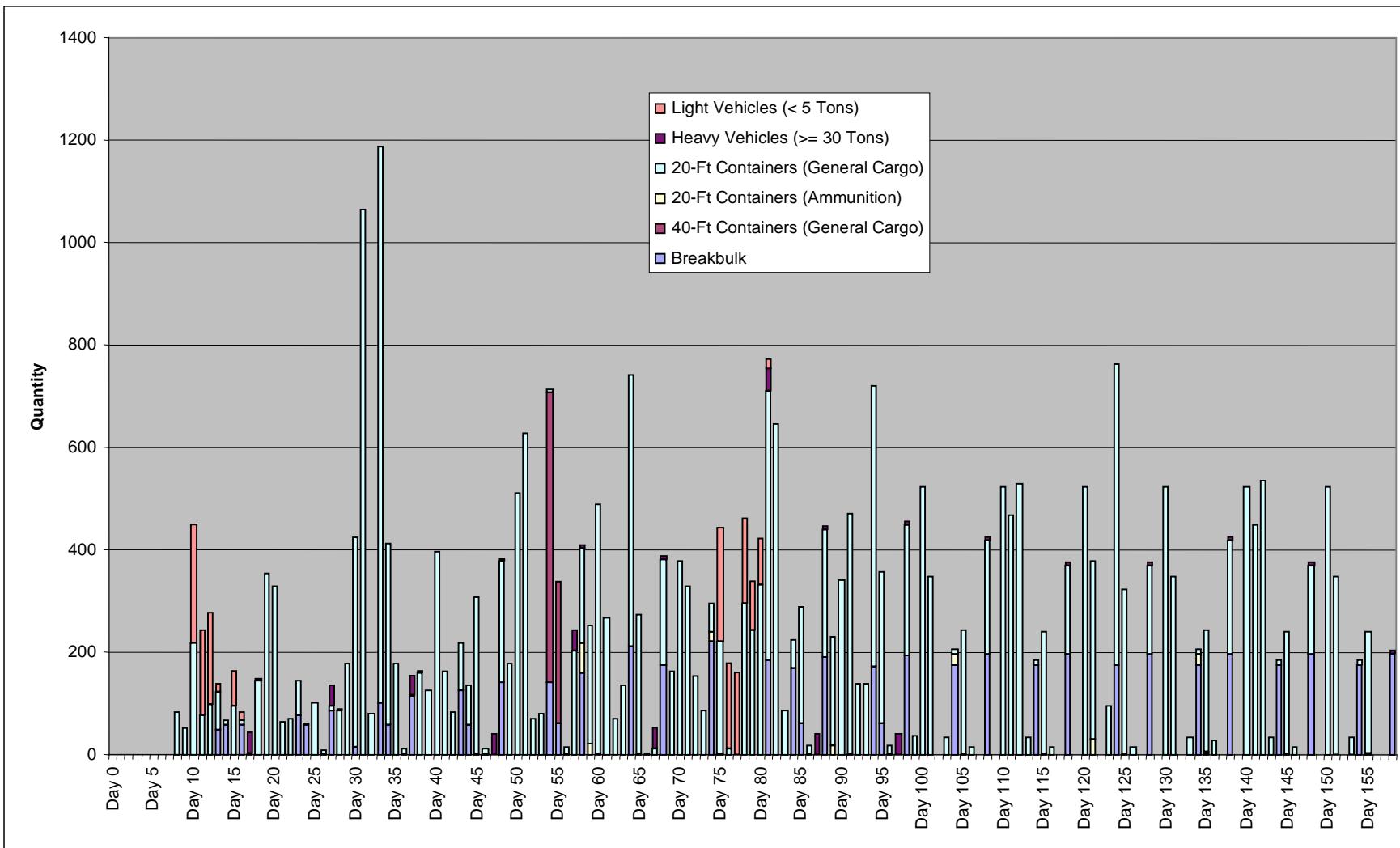


Figure A-5. Total Quantity of Cargo Items Arriving at the Port of Seattle

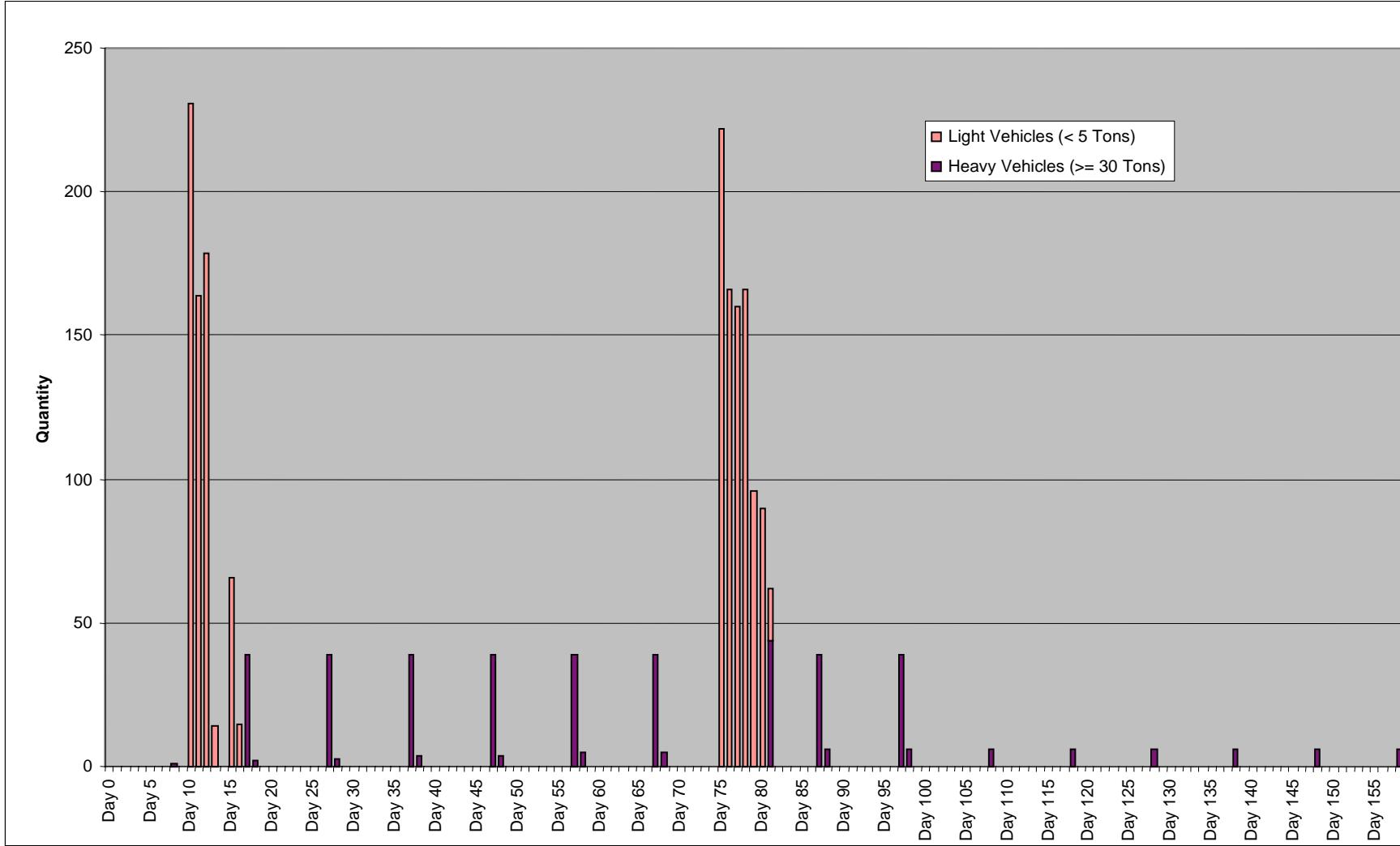


Figure A-6. Quantity of Vehicles Arriving at the Port of Seattle

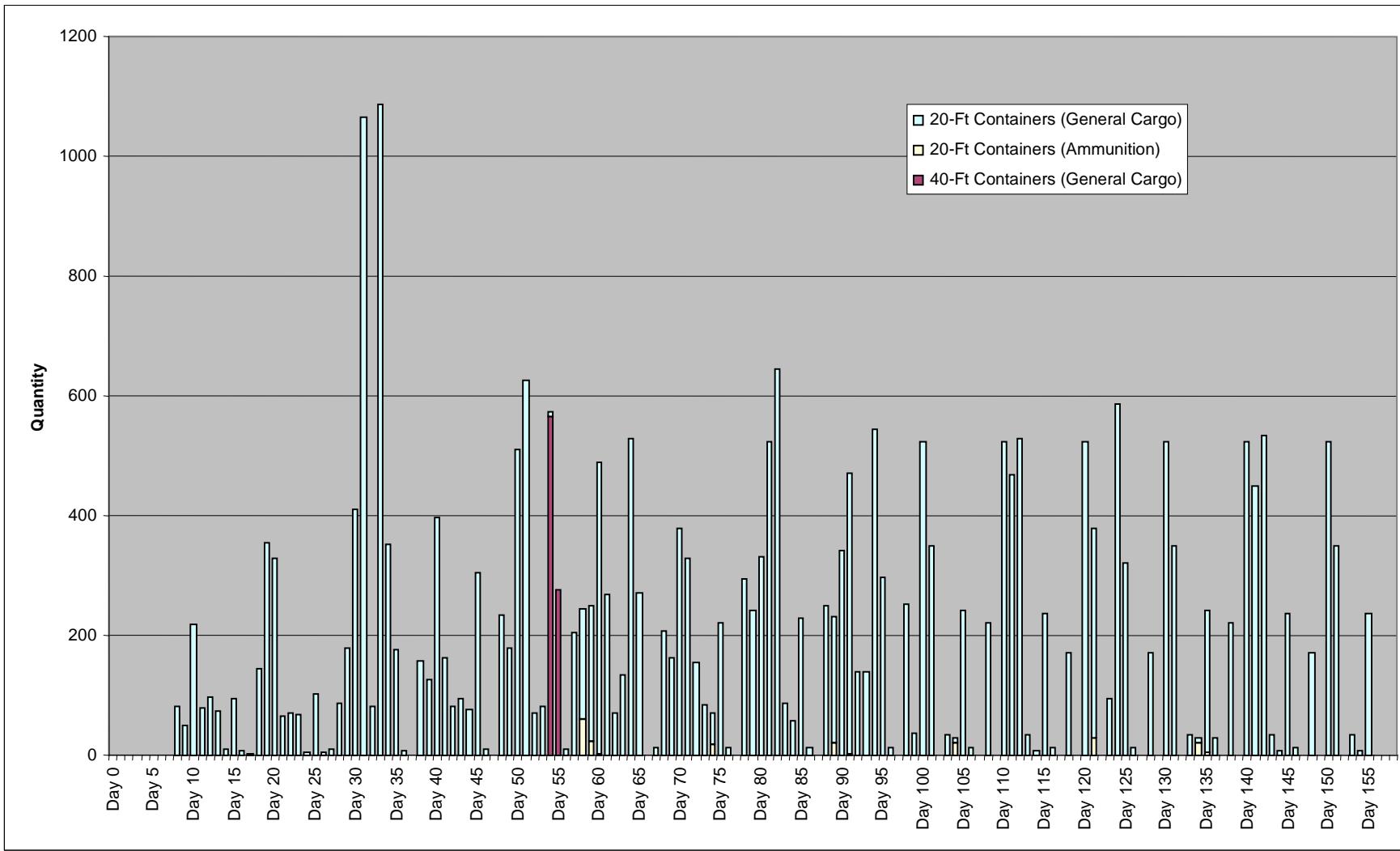


Figure A-7. Quantity of Containers Arriving at the Port of Seattle

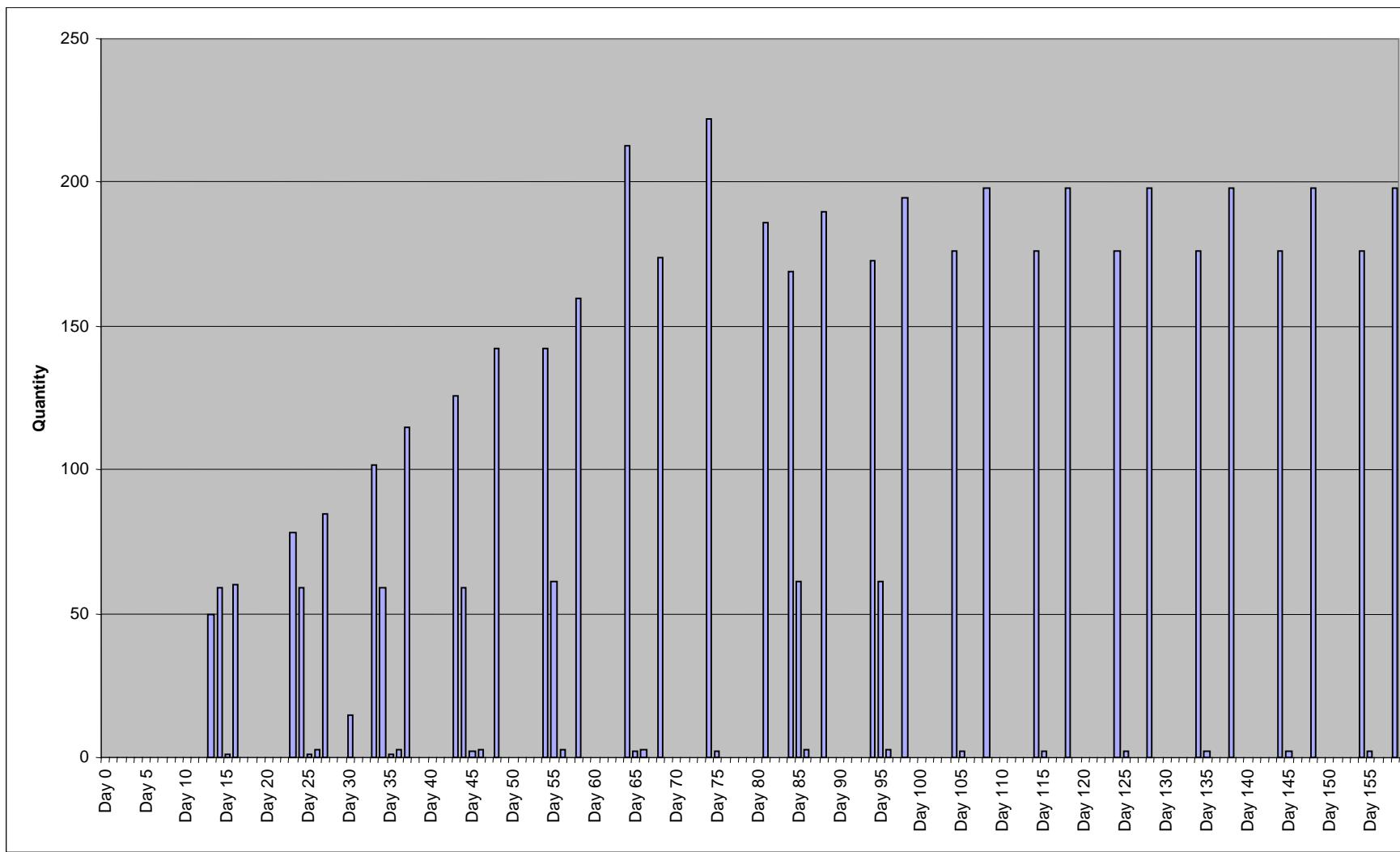


Figure A-8. Quantity of Breakbulk Cargo Items Arriving at the Port of Seattle

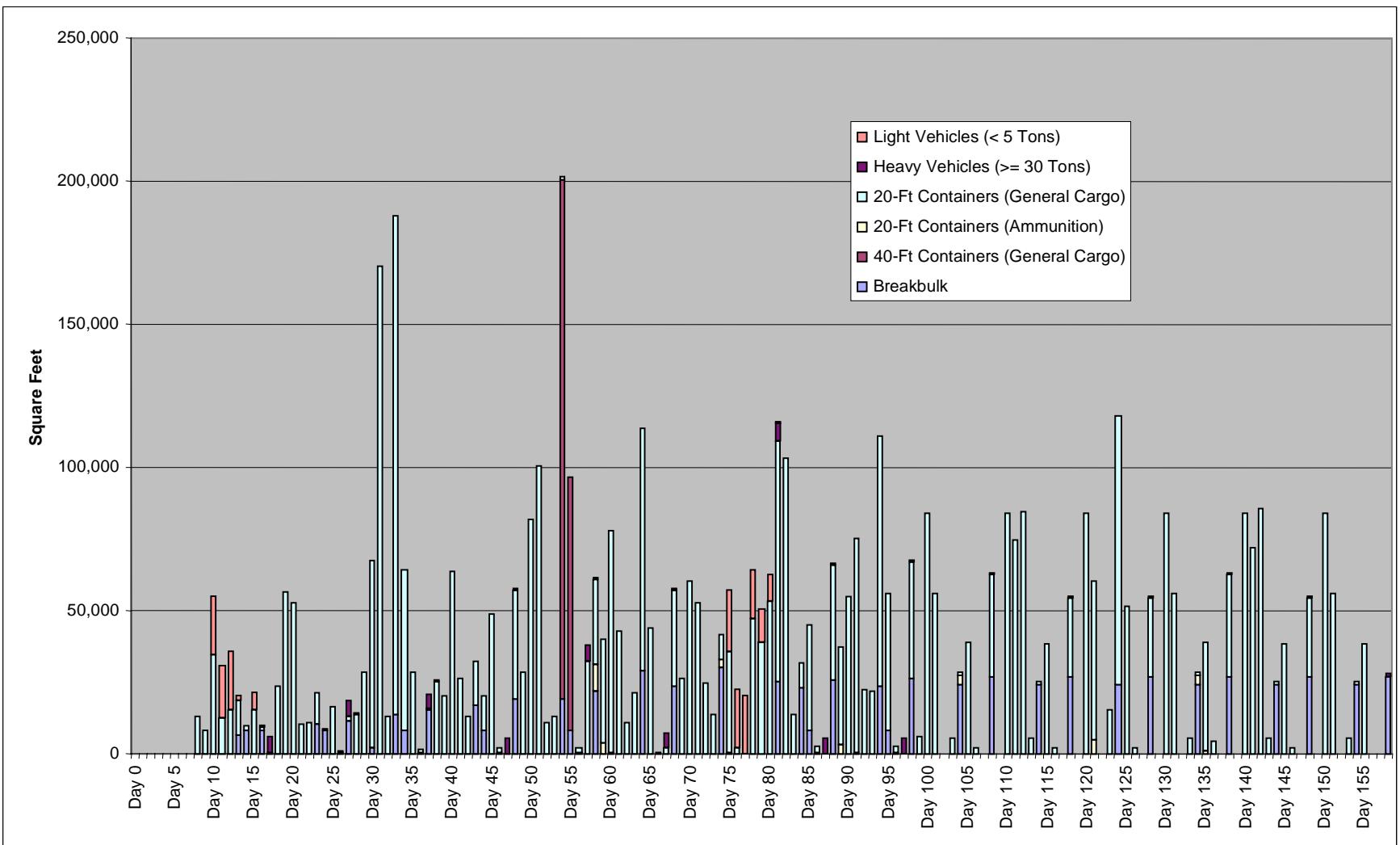


Figure A-9. Total Square Feet of Cargo Arriving at the Port of Seattle

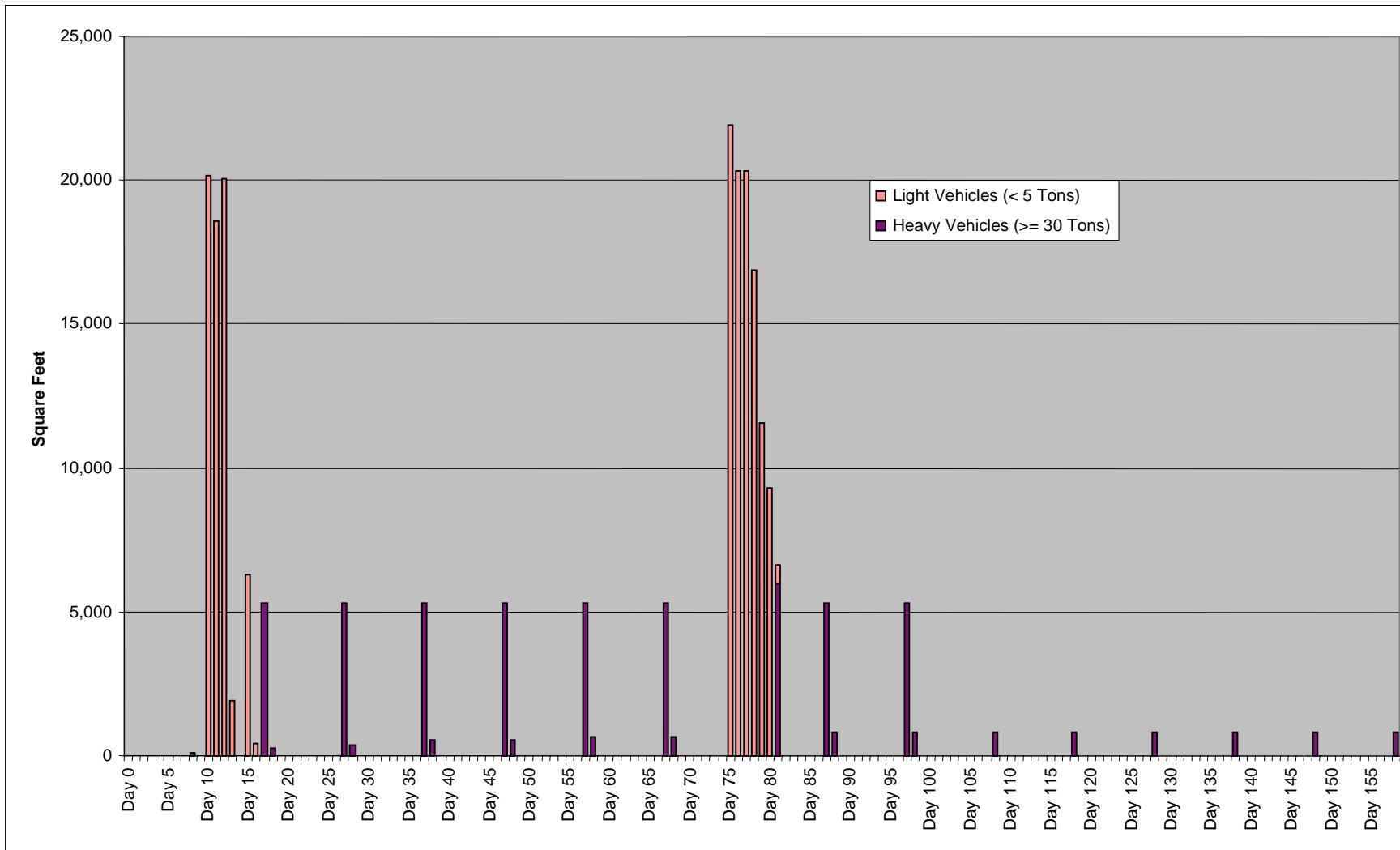


Figure A-10. Square Feet of Vehicles Arriving at the Port of Seattle

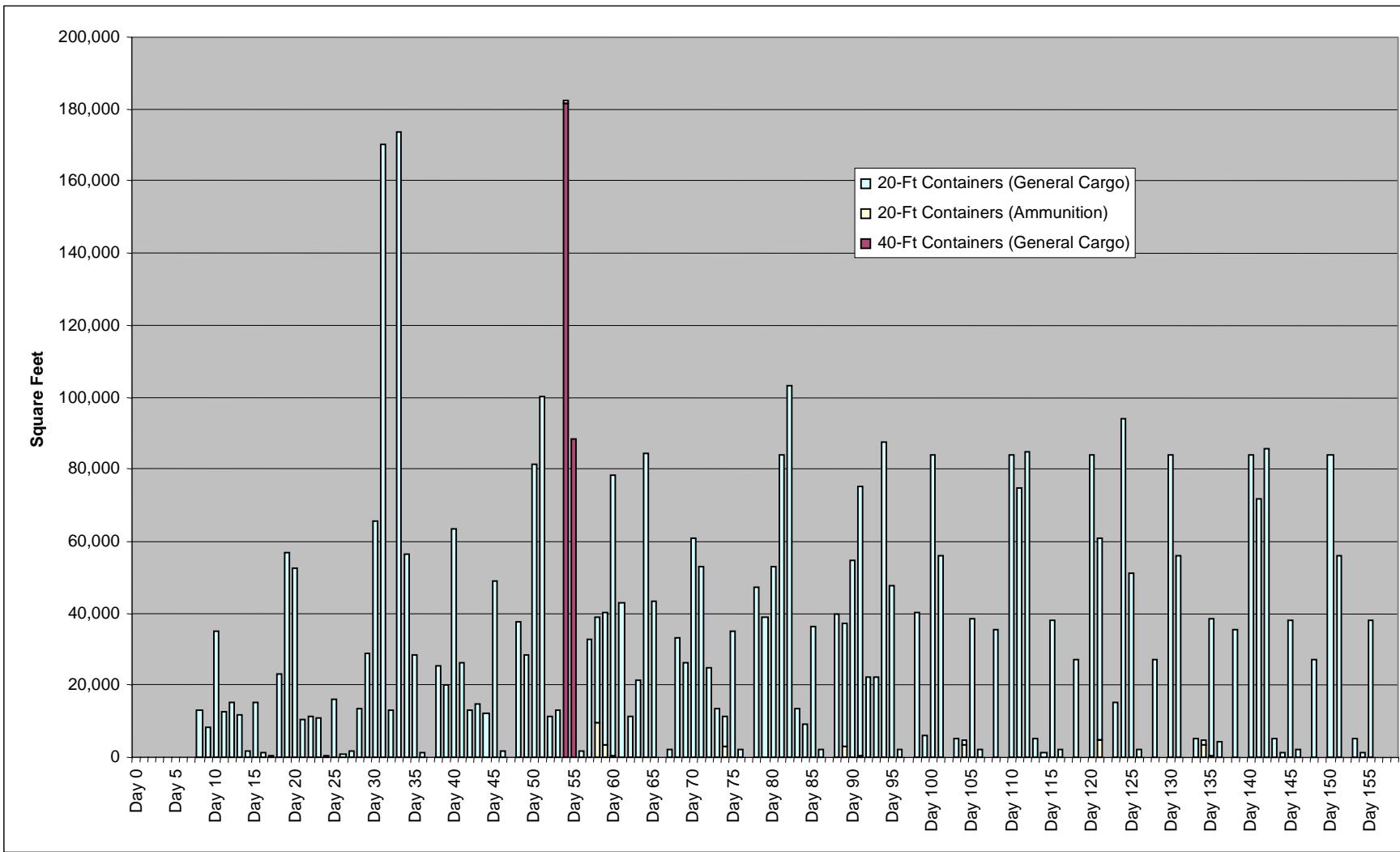


Figure A-11. Square Feet of Containers Arriving at the Port of Seattle

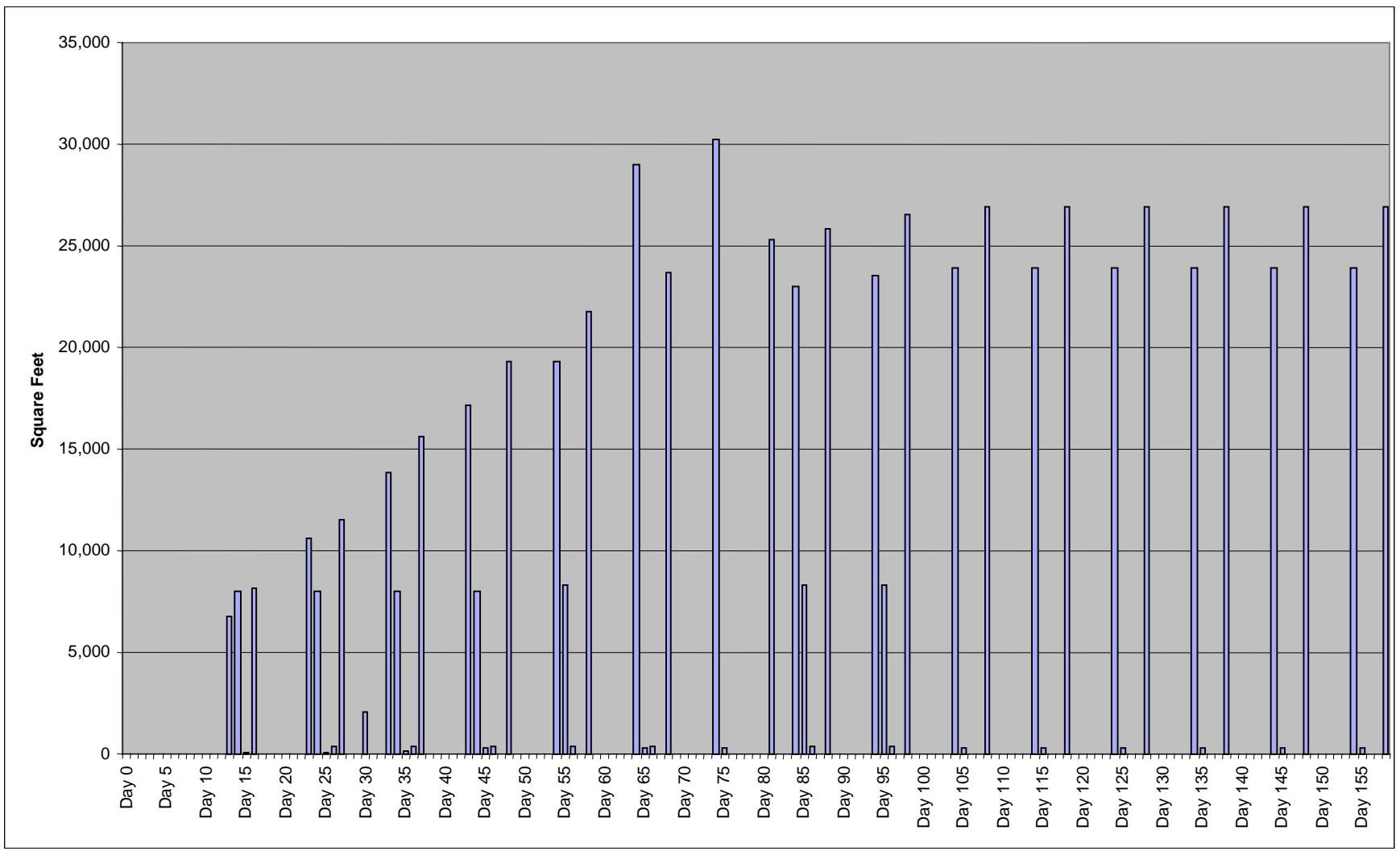


Figure A-12. Square Feet of Breakbulk Cargo Arriving at the Port of Seattle

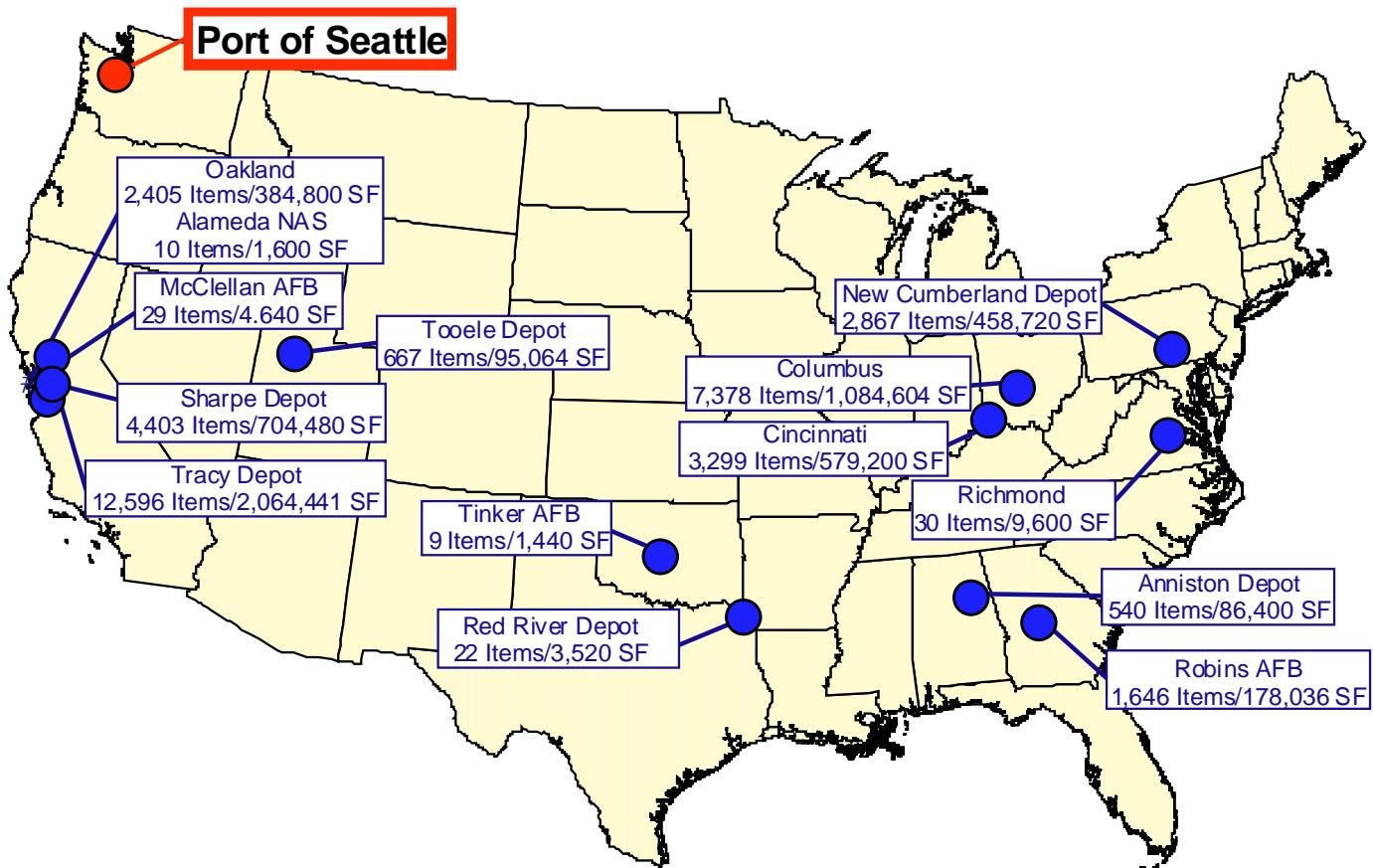


Figure A-13. Amount of Cargo Arriving at the Port of Seattle by Origin

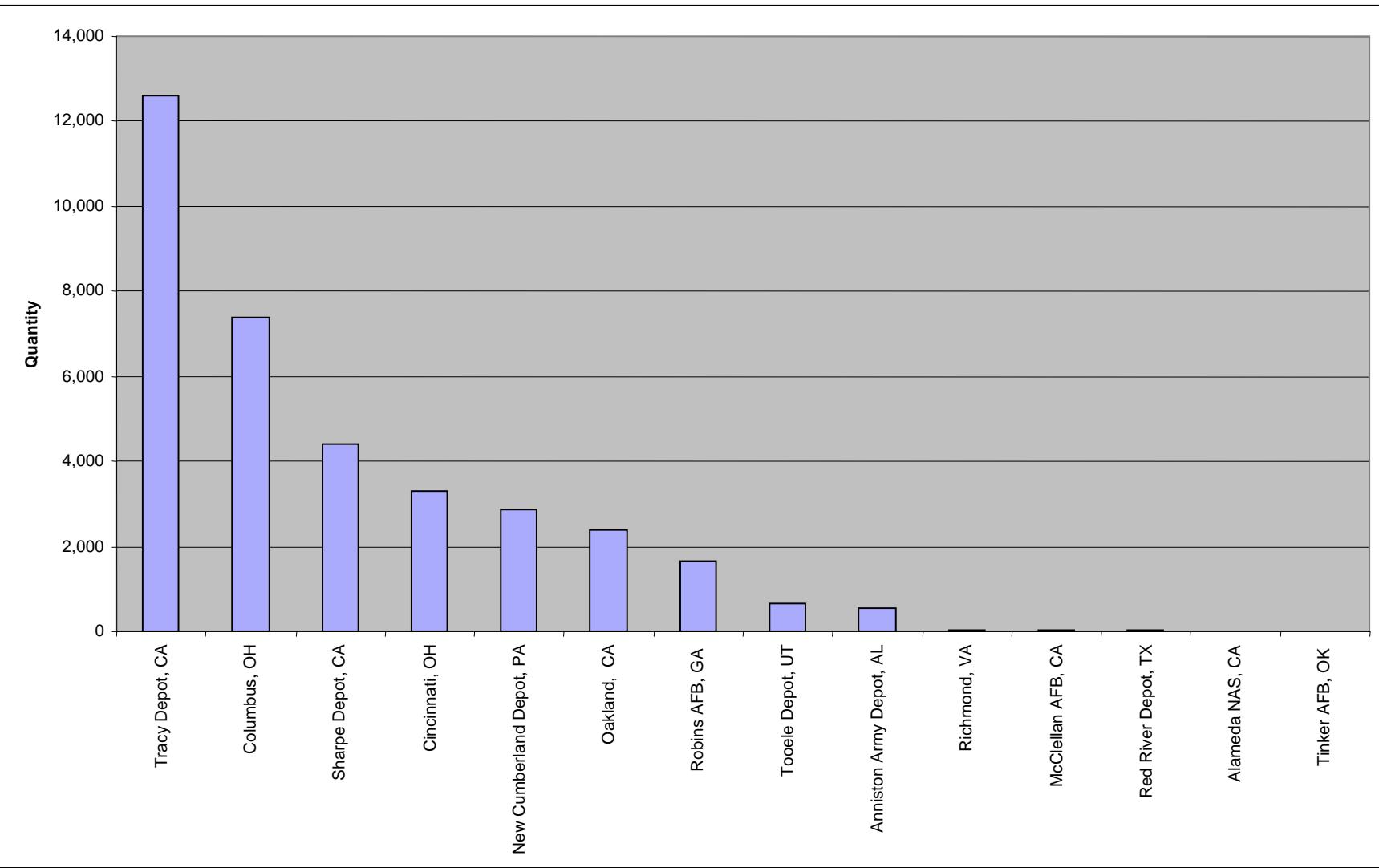


Figure A-14. Quantity of Items Arriving at the Port of Seattle by Origin

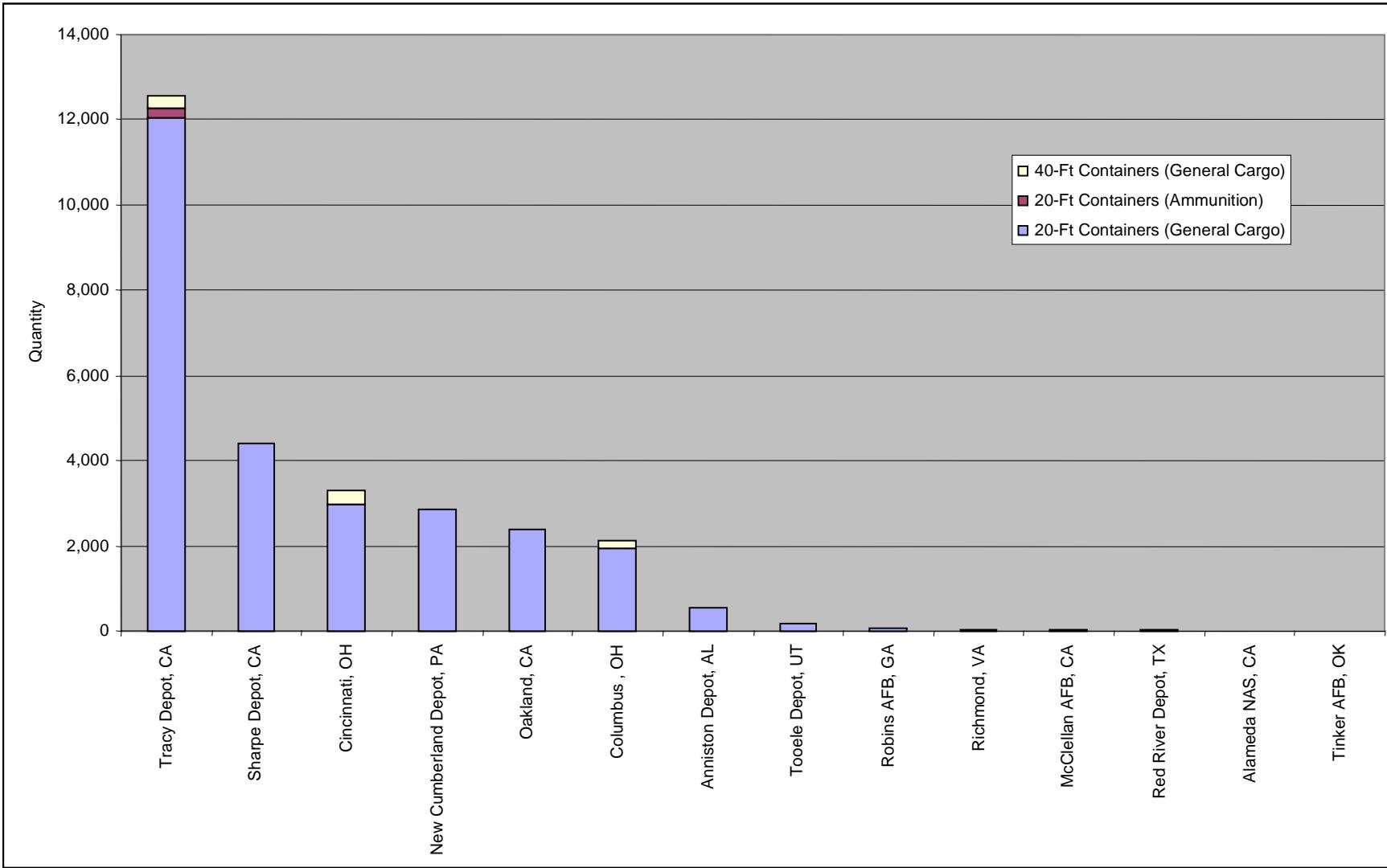


Figure A-15. Quantity of Containers Arriving at the Port of Seattle by Origin

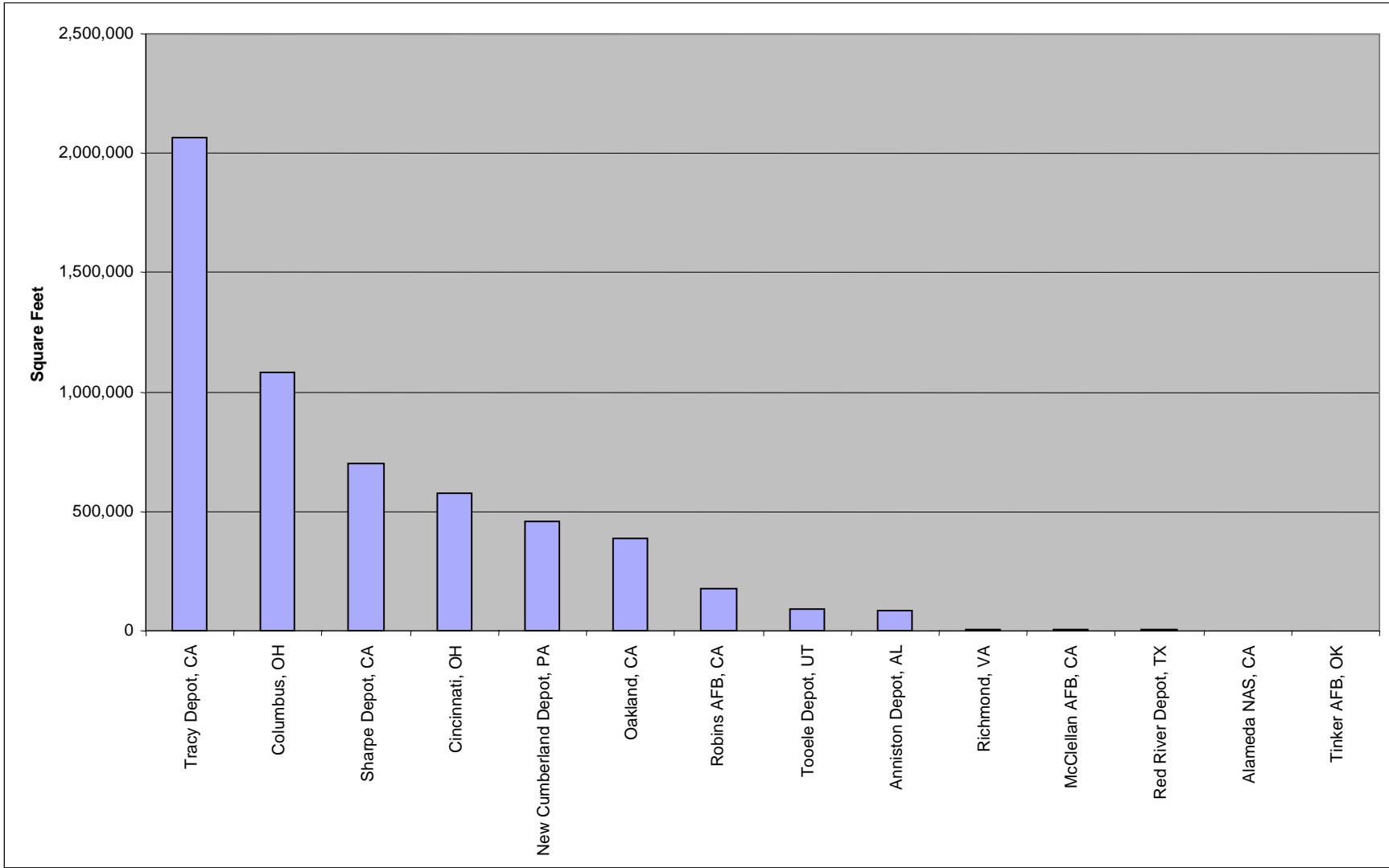


Figure A-16. Square Feet of Cargo Arriving at the Port of Seattle by Origin

## APPENDIX B

### Port of Tacoma

According to the TPFDD, there are thirty-three origins sending cargo to the Port of Tacoma. Figure B-1 shows the top twenty-five of these origins – those sending more than 100 items or more than 10,000 square feet of cargo. This cargo is primarily Army unit equipment.

Figures B-2 through B-6 represent how the cargo will arrive at the Port of Tacoma. Most of these origins are in excess of 400 miles away. Therefore, the majority of the cargo is arriving by rail (Figure B-4). There are aircraft that self-deploy to the port (Figure B-5), and some vehicles will convoy to the port (Figure B-6).

Figures B-7 through B-13 illustrate the quantity of items

arriving at the port. Figure B-7 is the total quantity of items arriving at the port. Figures B-8 and B-9 are the quantity of wheeled and tracked vehicles, respectively. The quantity of aircraft and floating craft are in Figures B-10 and B-11, respectively. Figure B-12 is the quantity of containers arriving at the port, and Figure B-13 is the quantity of breakbulk cargo items arriving at the port.

Similar to Figures B-7 through B-13, which lay out the quantity of items arriving, Figures B-14 through B-20 outline the square footage of these categories of cargo.





Figure B-21 illustrates the quantity of items arriving at the Port of Tacoma by mode. Figure B-22 through 24 shows the breakdown of items convoying, arriving by rail, and flying to the port.

Similar to Figures B-21 through B-24, Figures B-25 through B-28 show the square footage of the cargo convoying, arriving by rail, and flying to the Port of Tacoma.

As shown earlier, cargo arrives at the Port of Tacoma from many distinct origins. Figure B-29 shows visually the amount of cargo coming from each of the major contributing origins. Figures B-30 and B-32 show the quantity and square feet, respectively, of cargo arriving at the Port of Tacoma by origin, and Figure B-31 outlines the quantity of containers arriving at the port from each origin. Origins sending less than 100 items or 10,000 square feet of cargo are listed in Tables B-1 through B-3



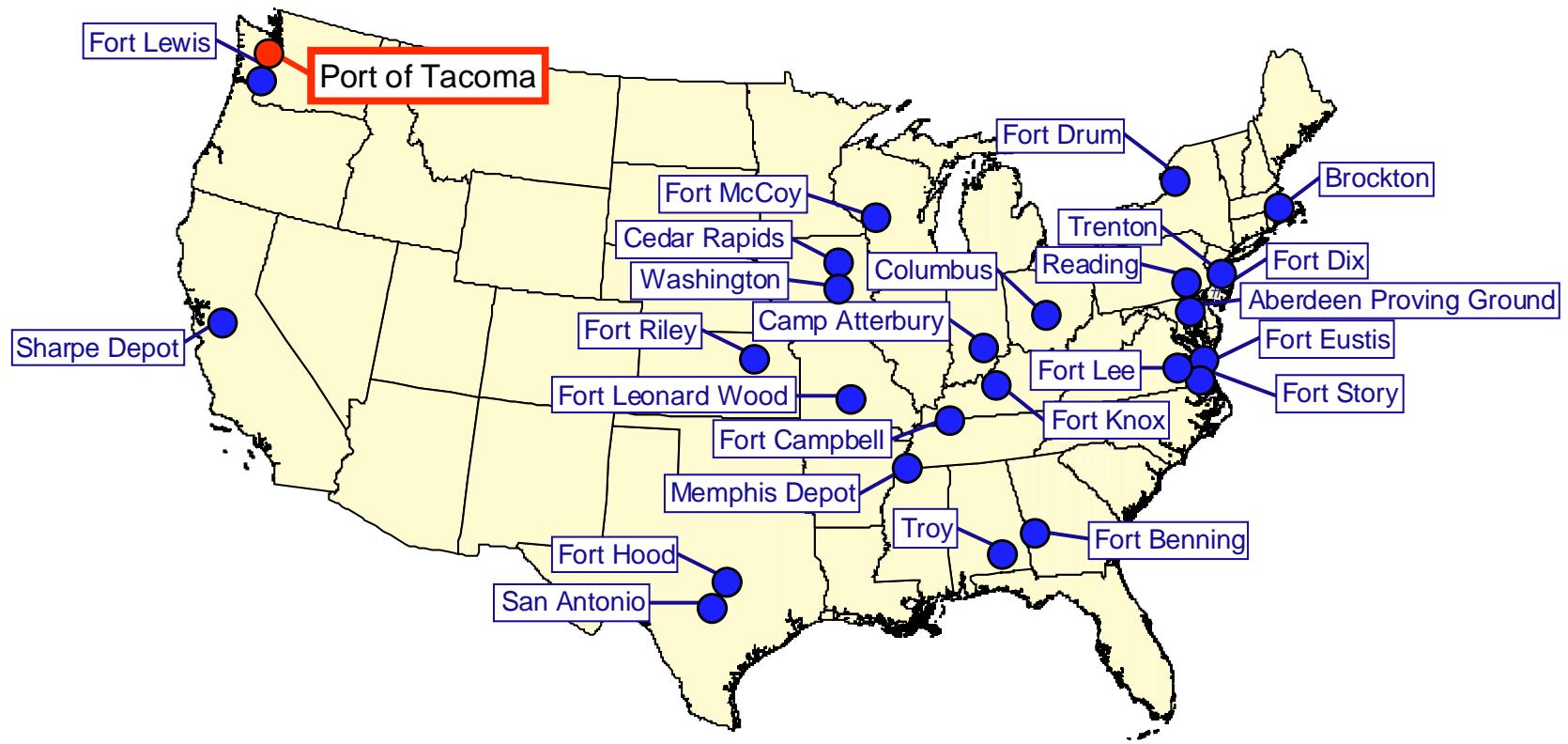


Figure B-1 Cargo Arrives at the Port of Tacoma from Many Origins

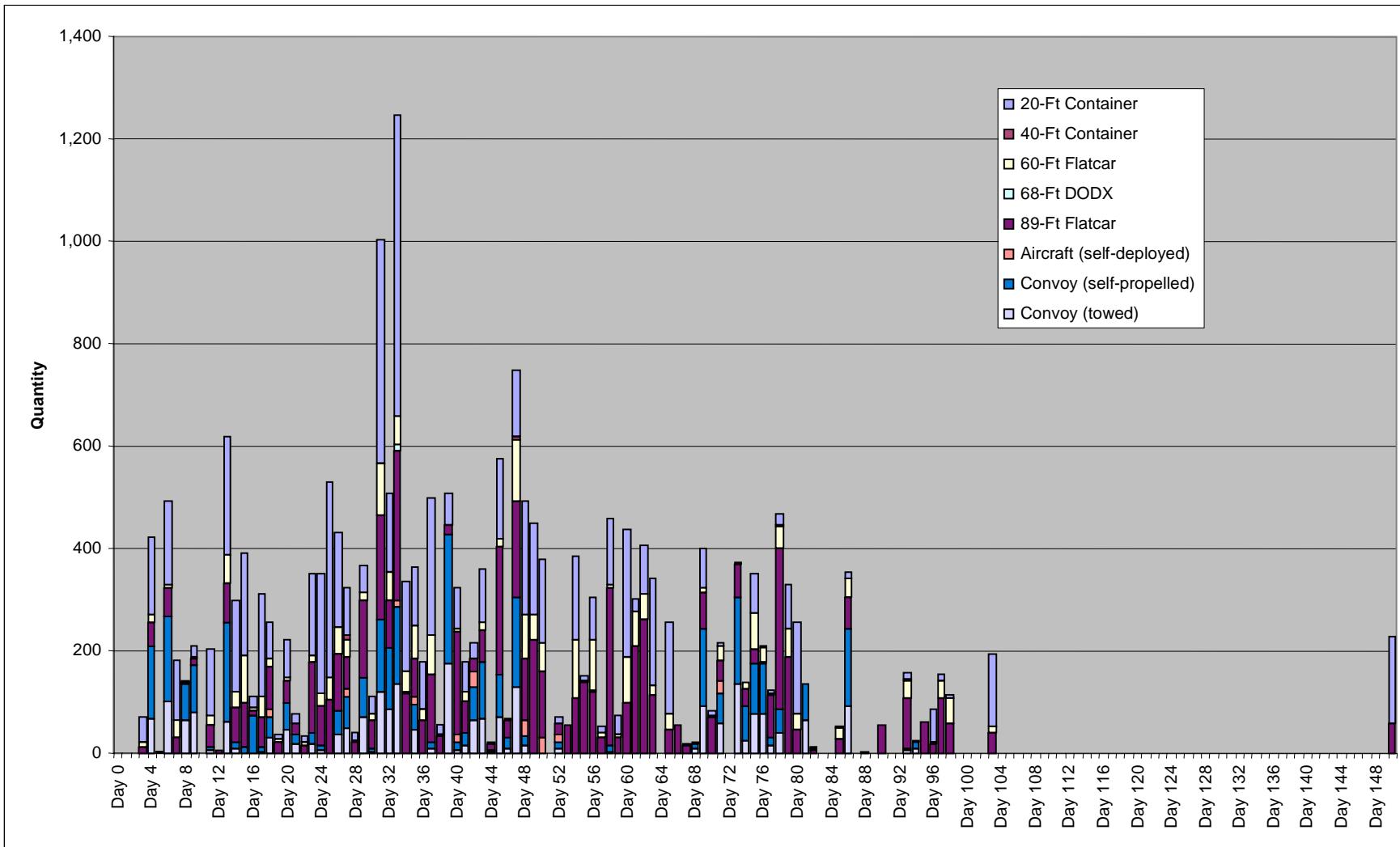


Figure B-2. Total Quantity of Transports Arriving at the Port of Tacoma

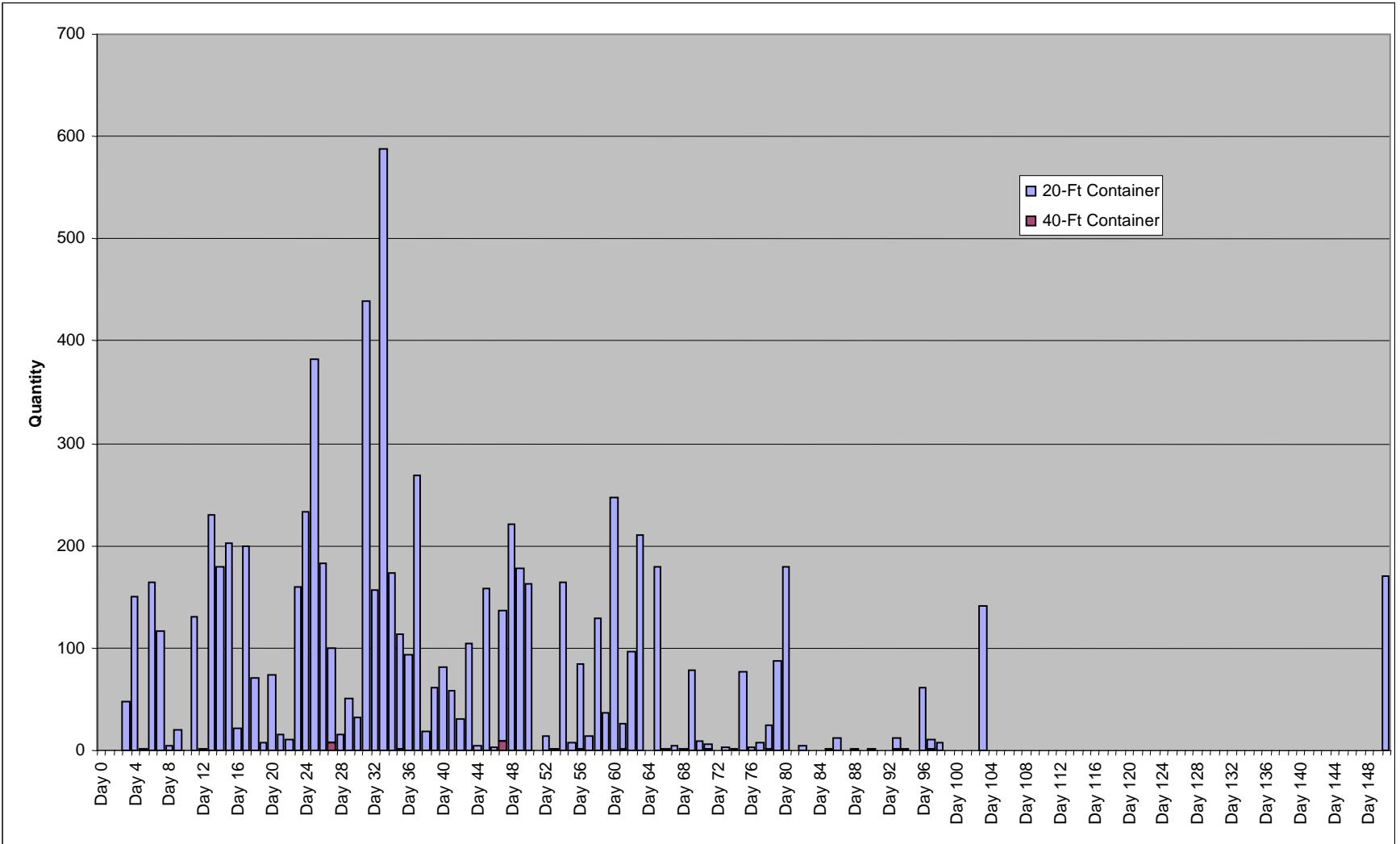


Figure B-3. Quantity of Containers Arriving at the Port of Tacoma

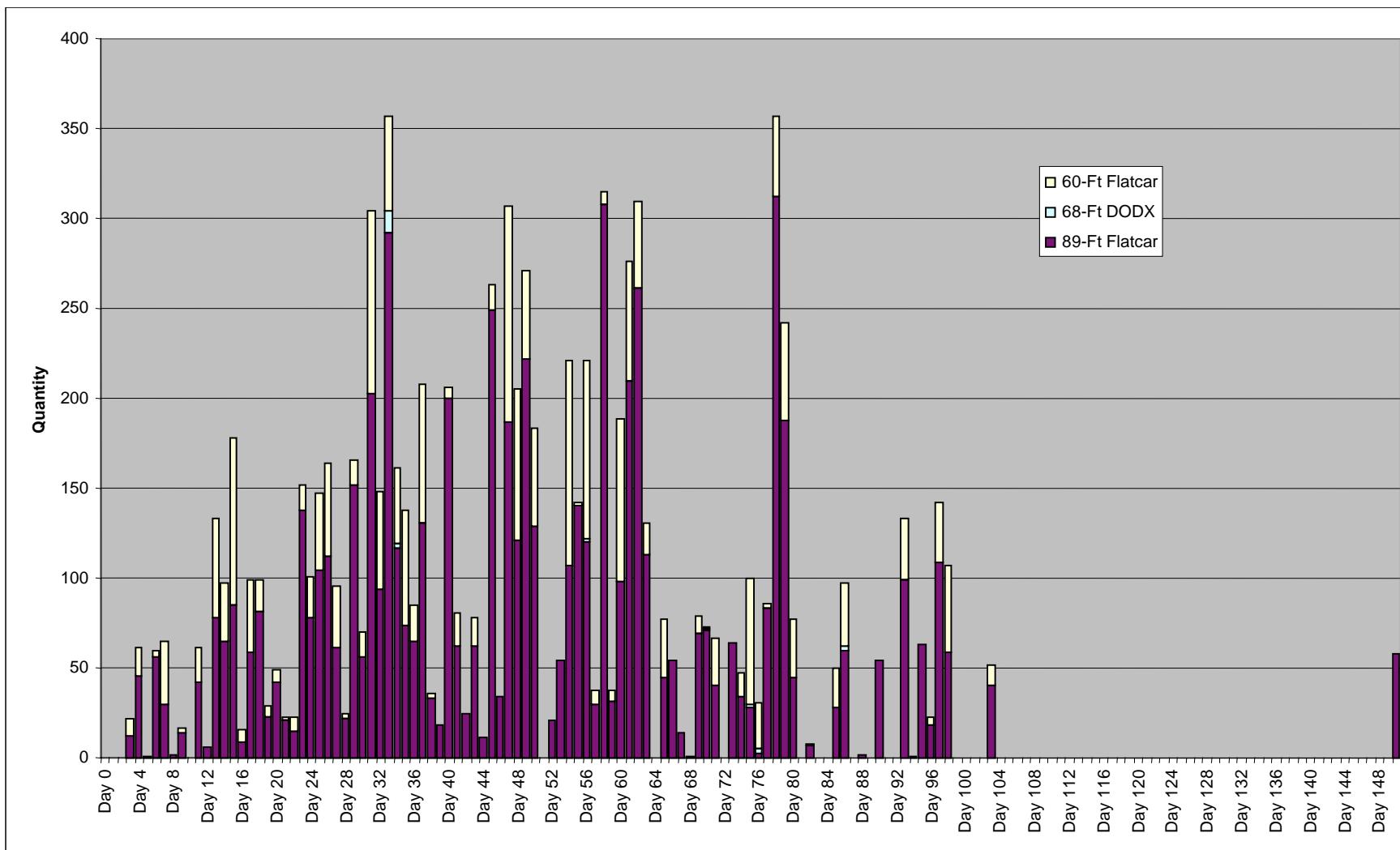
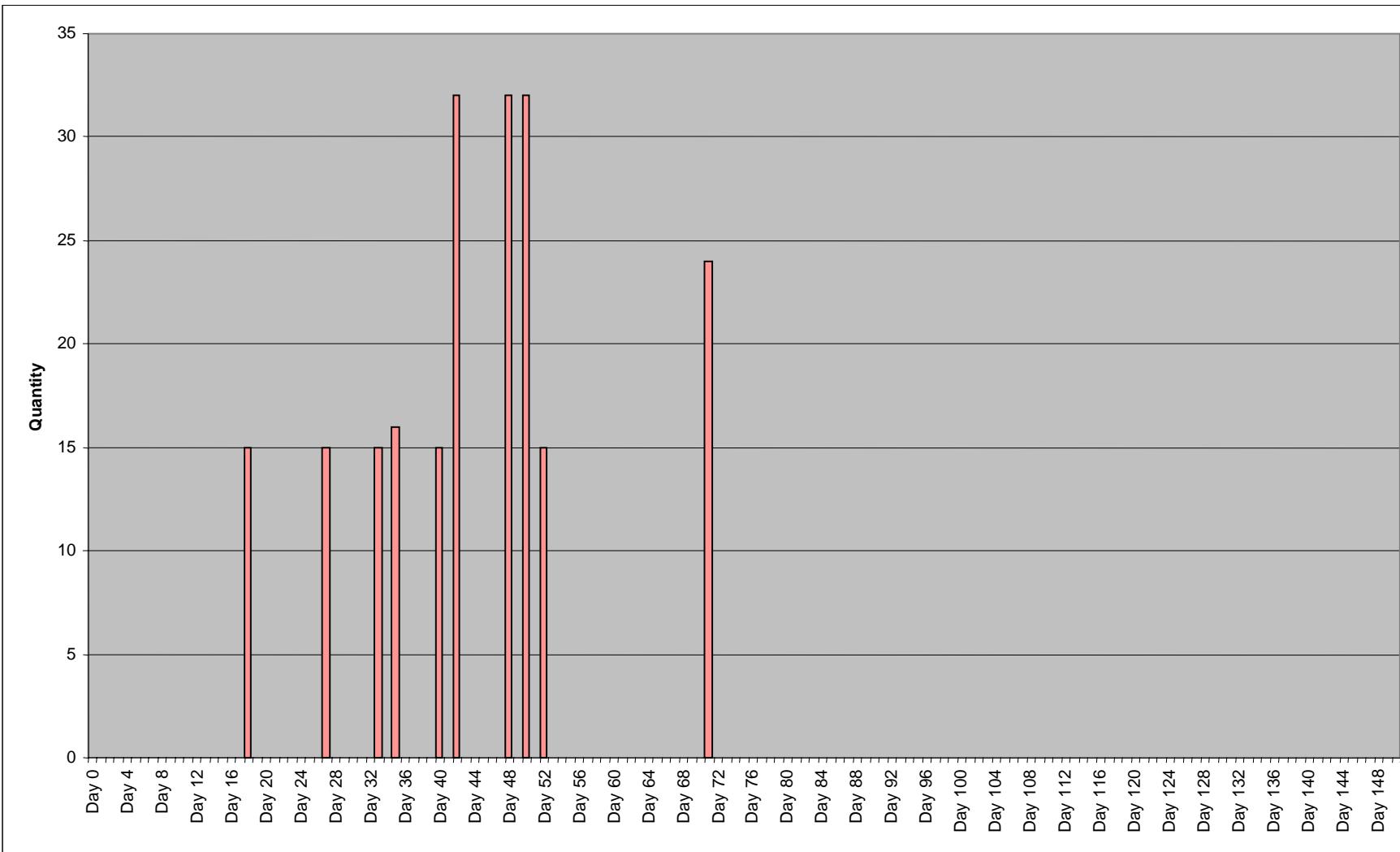
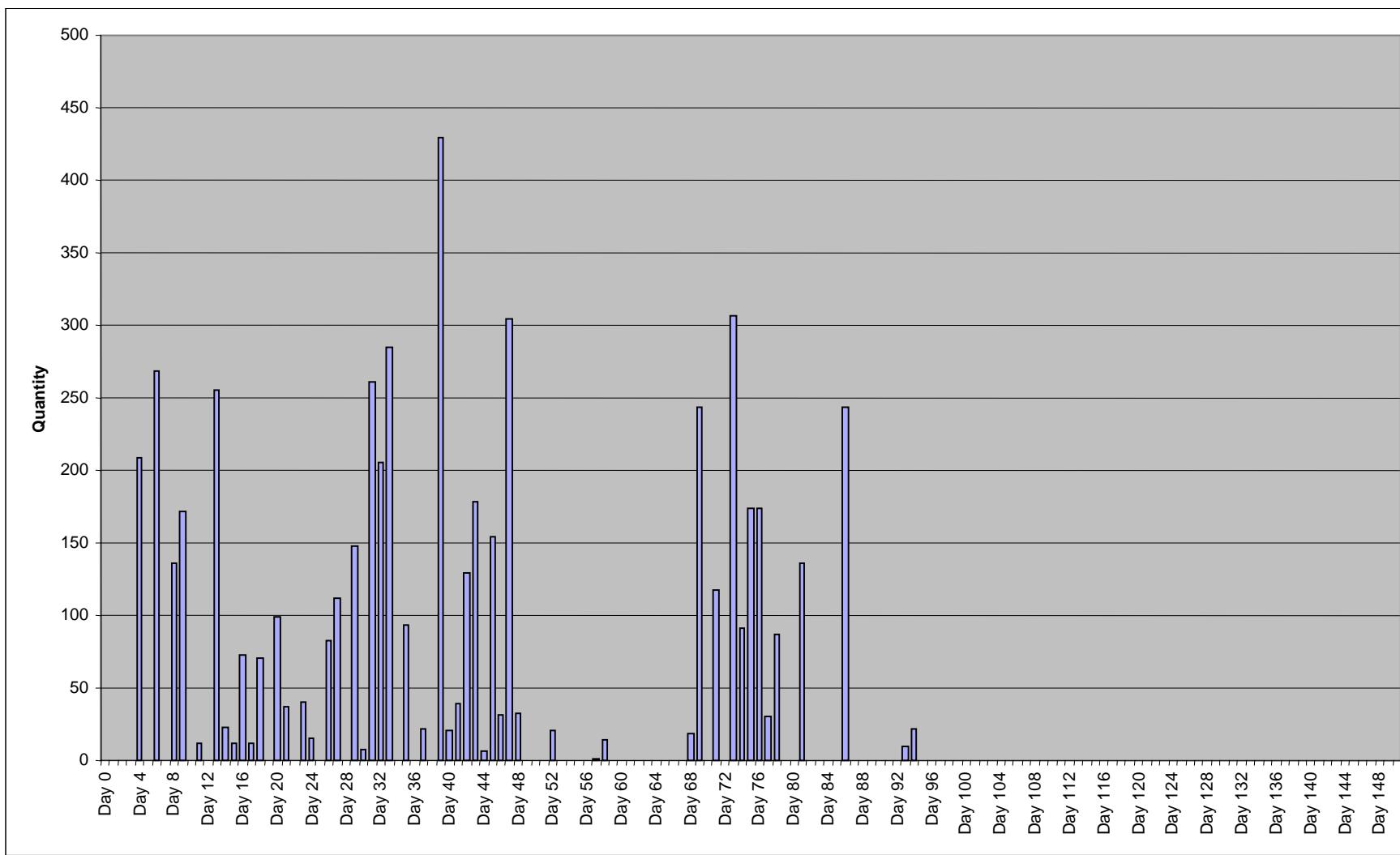


Figure B-4. Quantity of Railcars Arriving at the Port of Tacoma



*Figure B-5. Quantity of Aircraft Arriving at the Port of Tacoma*



*Figure B-6. Quantity of Convoy Vehicles Arriving at the Port of Tacoma*

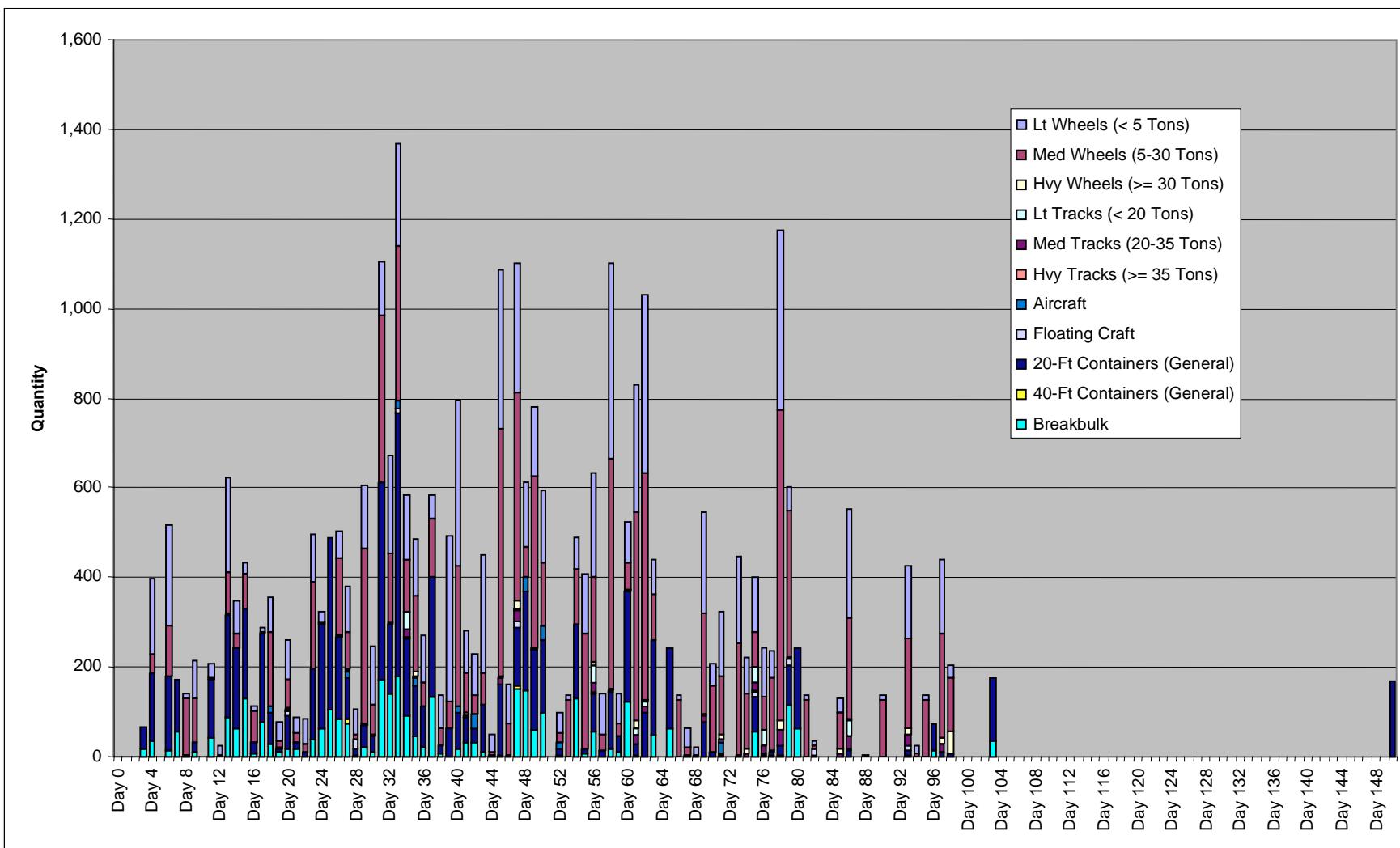


Figure B-7. Total Quantity of Cargo Items Arriving at the Port of Tacoma

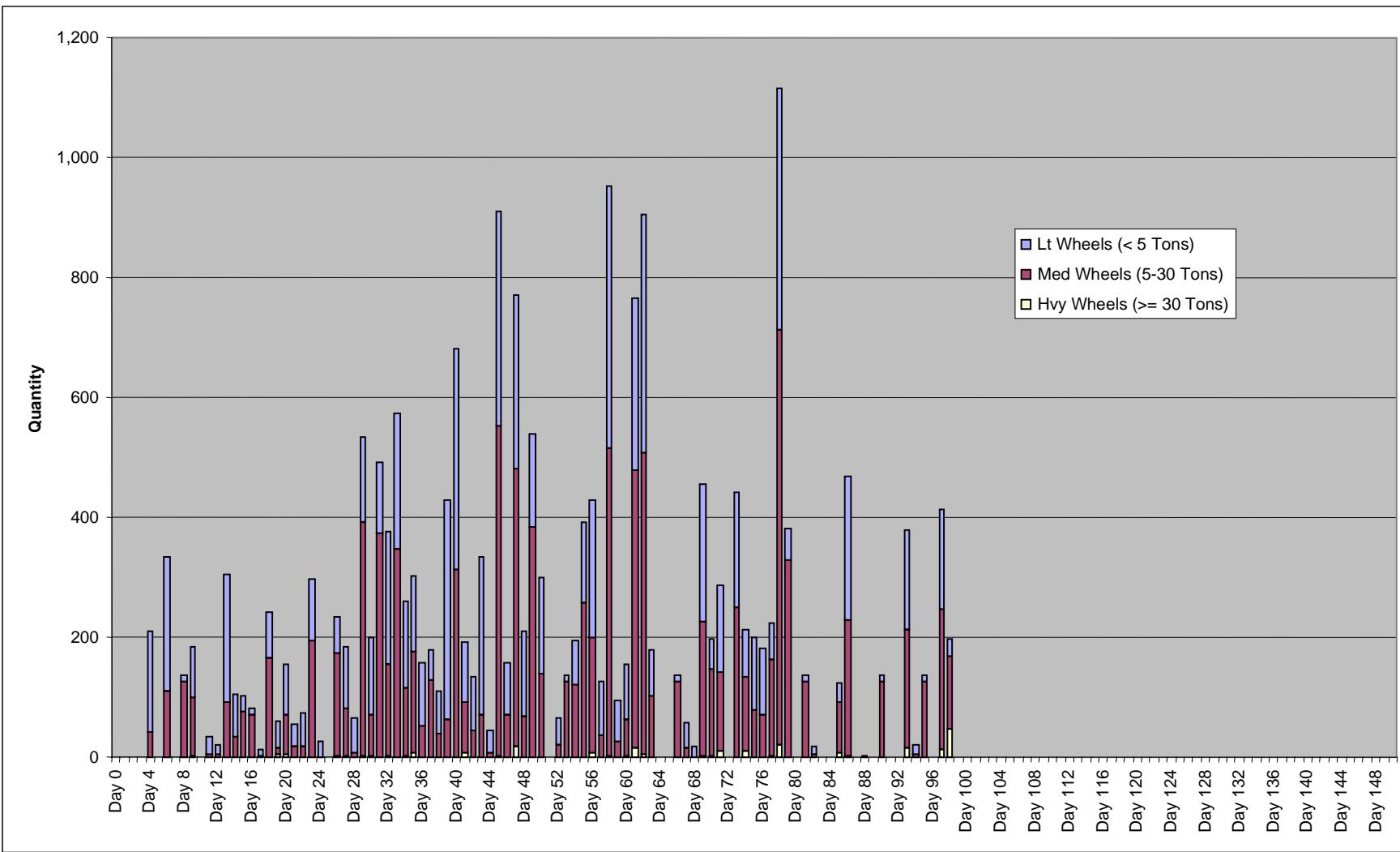


Figure B-8. Quantity of Wheeled Vehicles Arriving at the Port of Tacoma

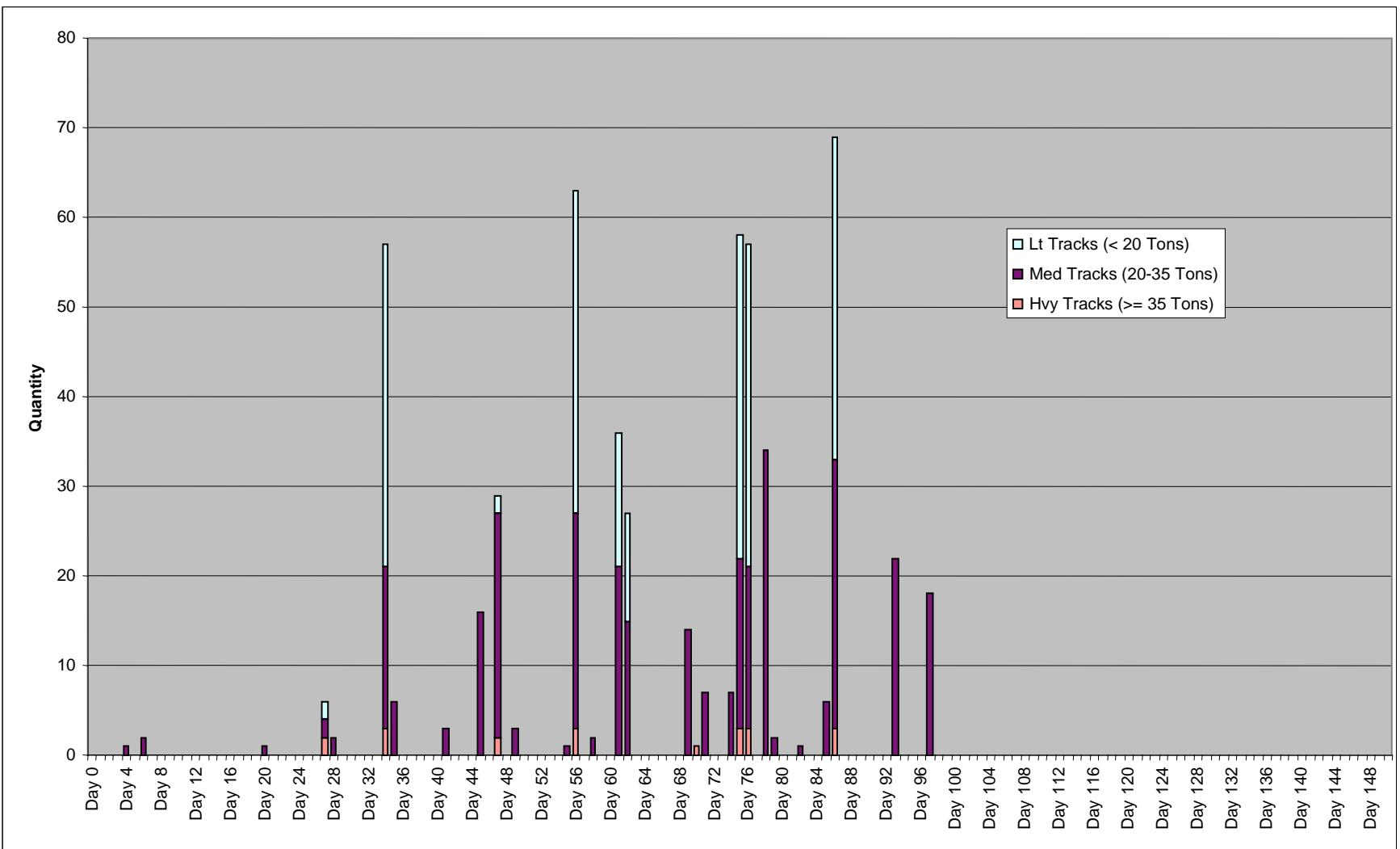
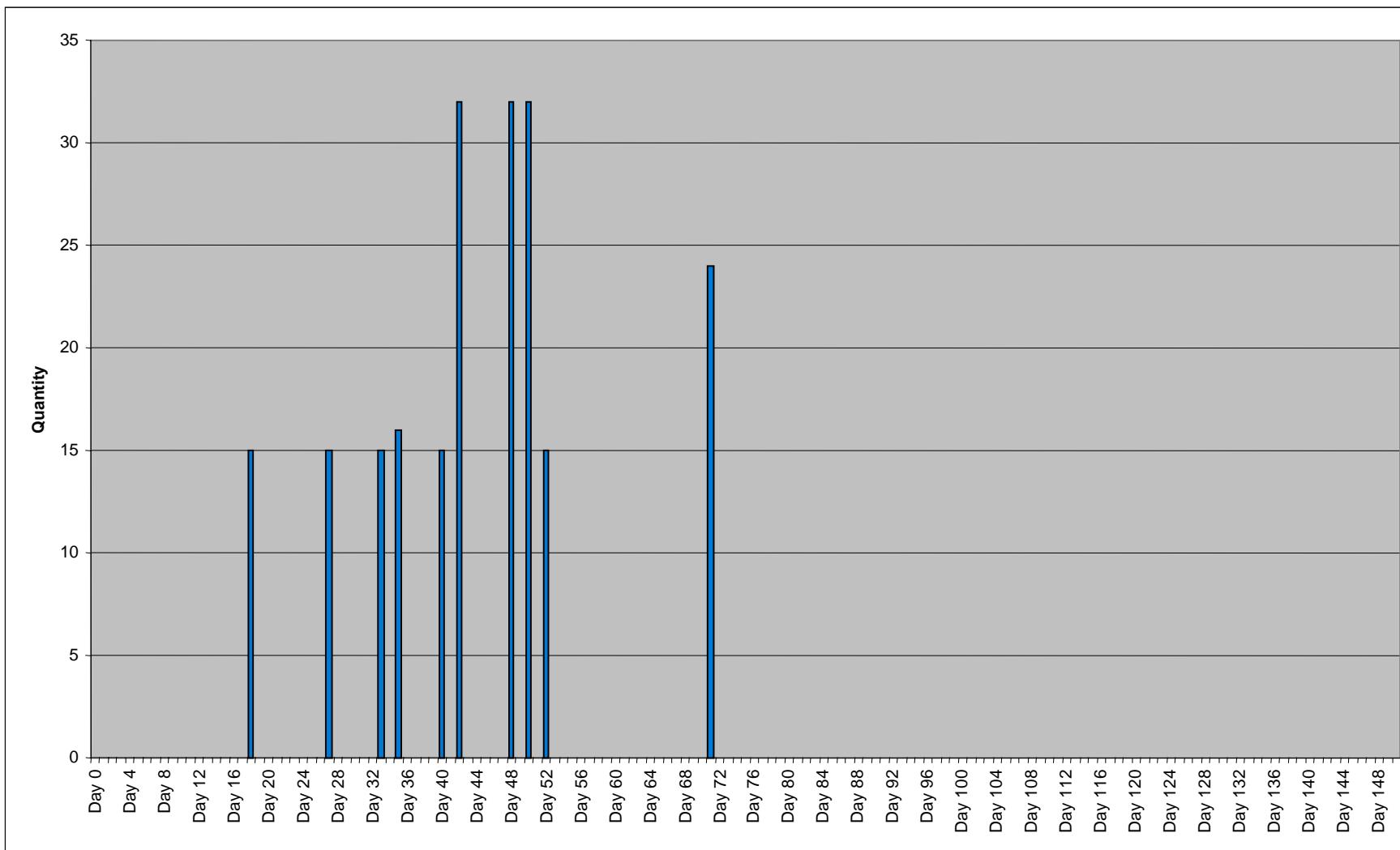


Figure B-9. Quantity of Tracked Vehicles Arriving at the Port of Tacoma



*Figure B-10. Quantity of Aircraft Arriving at the Port of Tacoma*

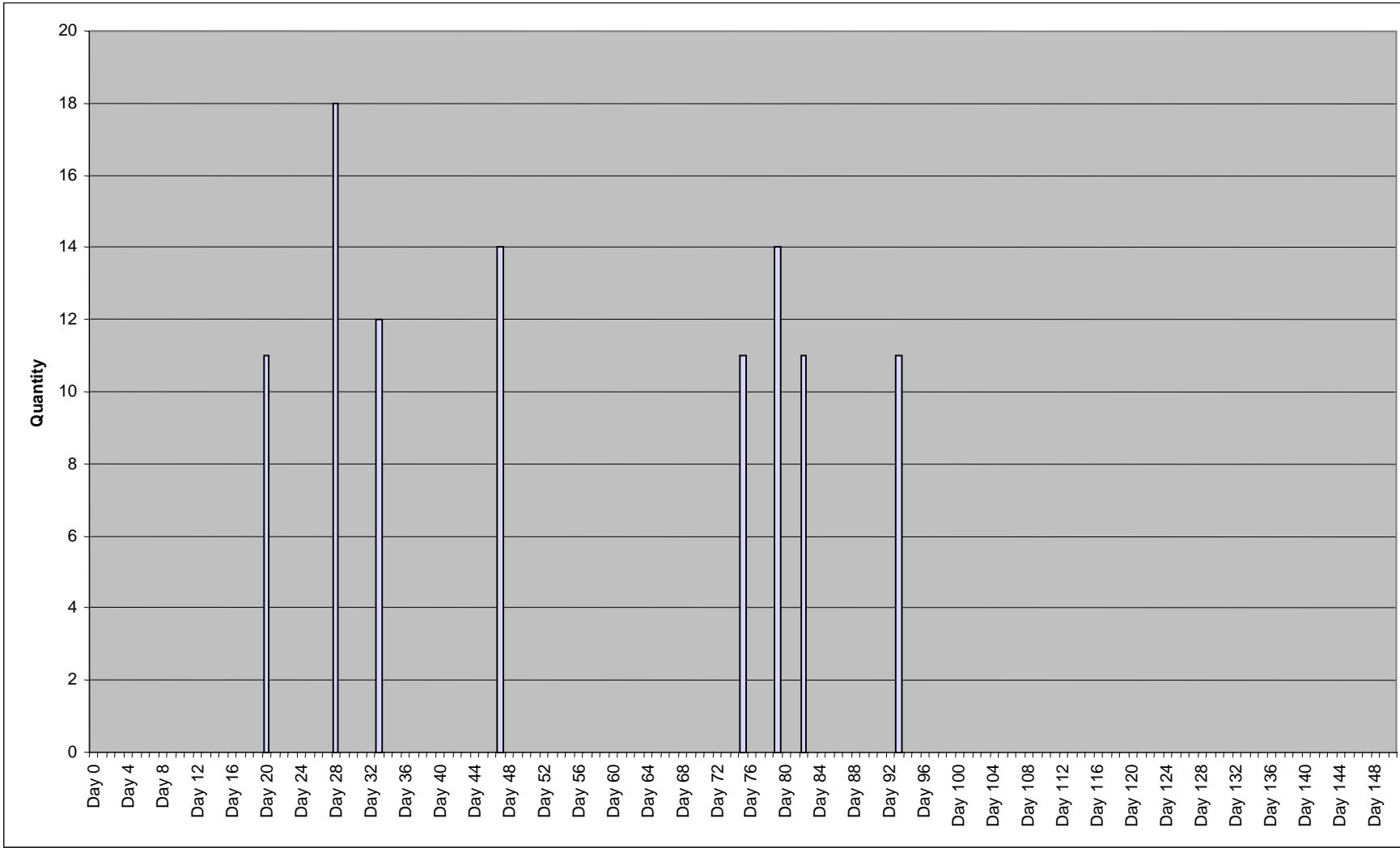


Figure B-11. Quantity of Floating Craft Arriving at the Port of Tacoma

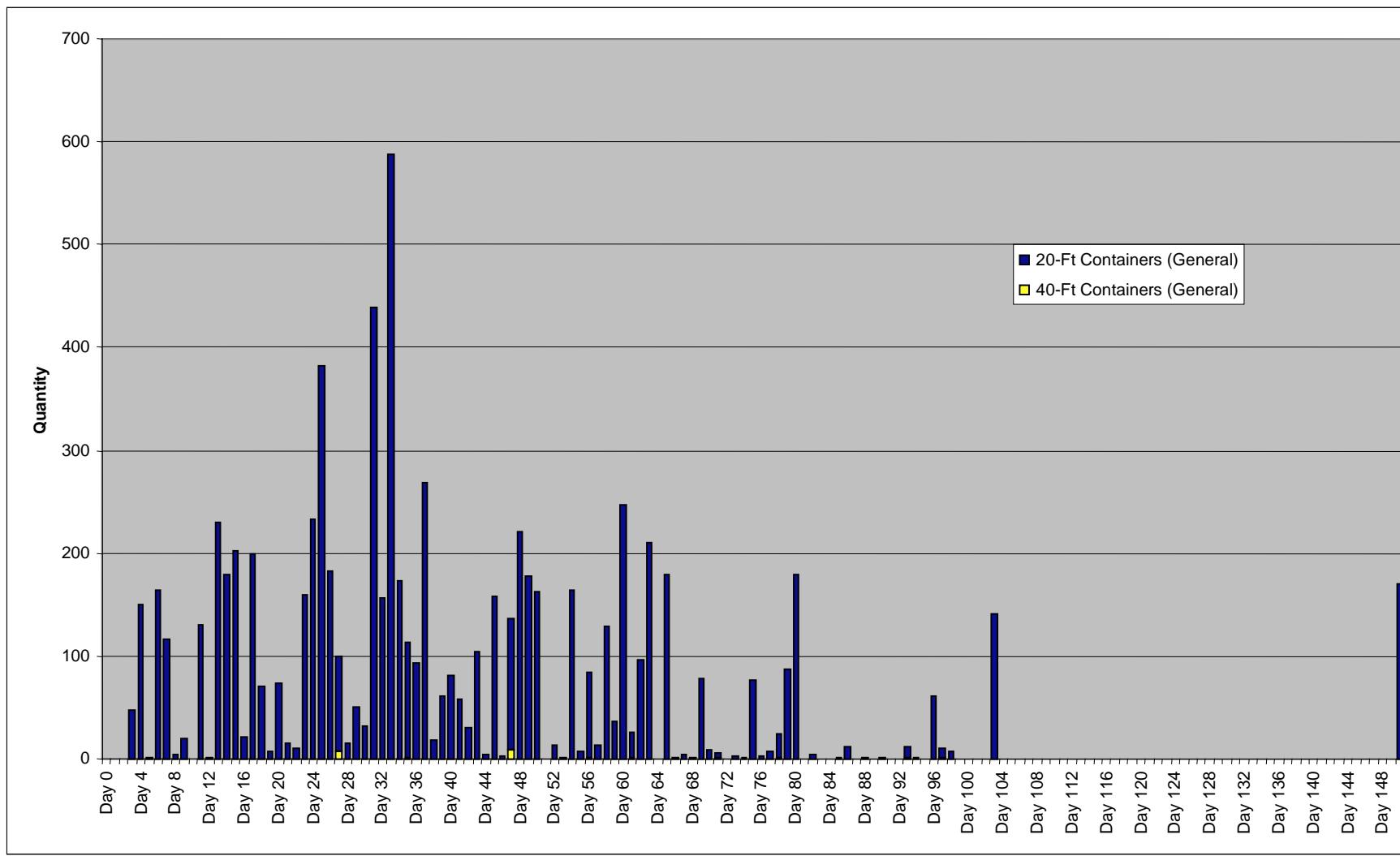


Figure B-12. Quantity of Containers Arriving at the Port of Tacoma

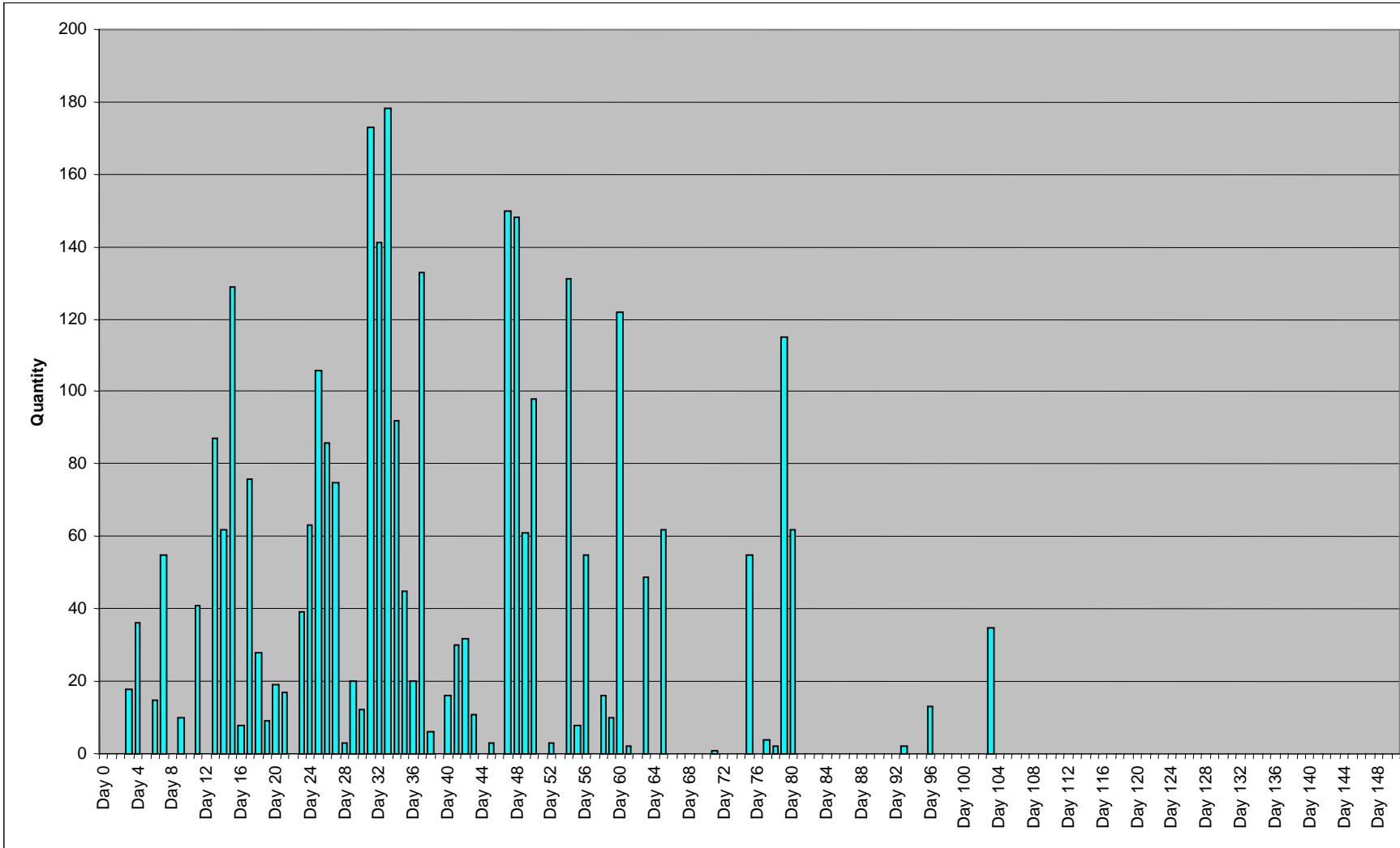


Figure B-13. Quantity of Breakbulk Cargo Items Arriving at the Port of Tacoma

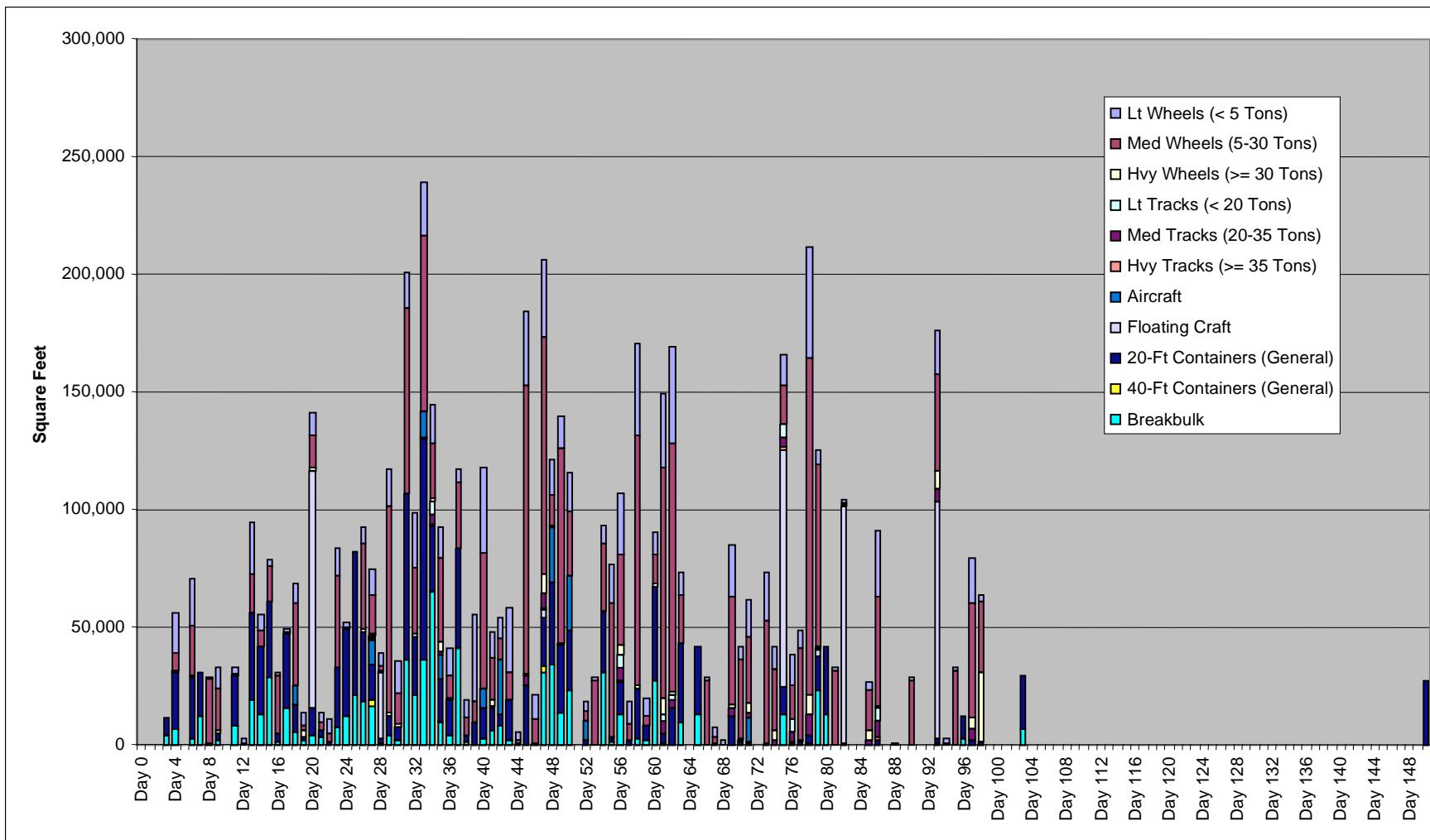


Figure B-14. Total Square Feet of Cargo Arriving at the Port of Tacoma

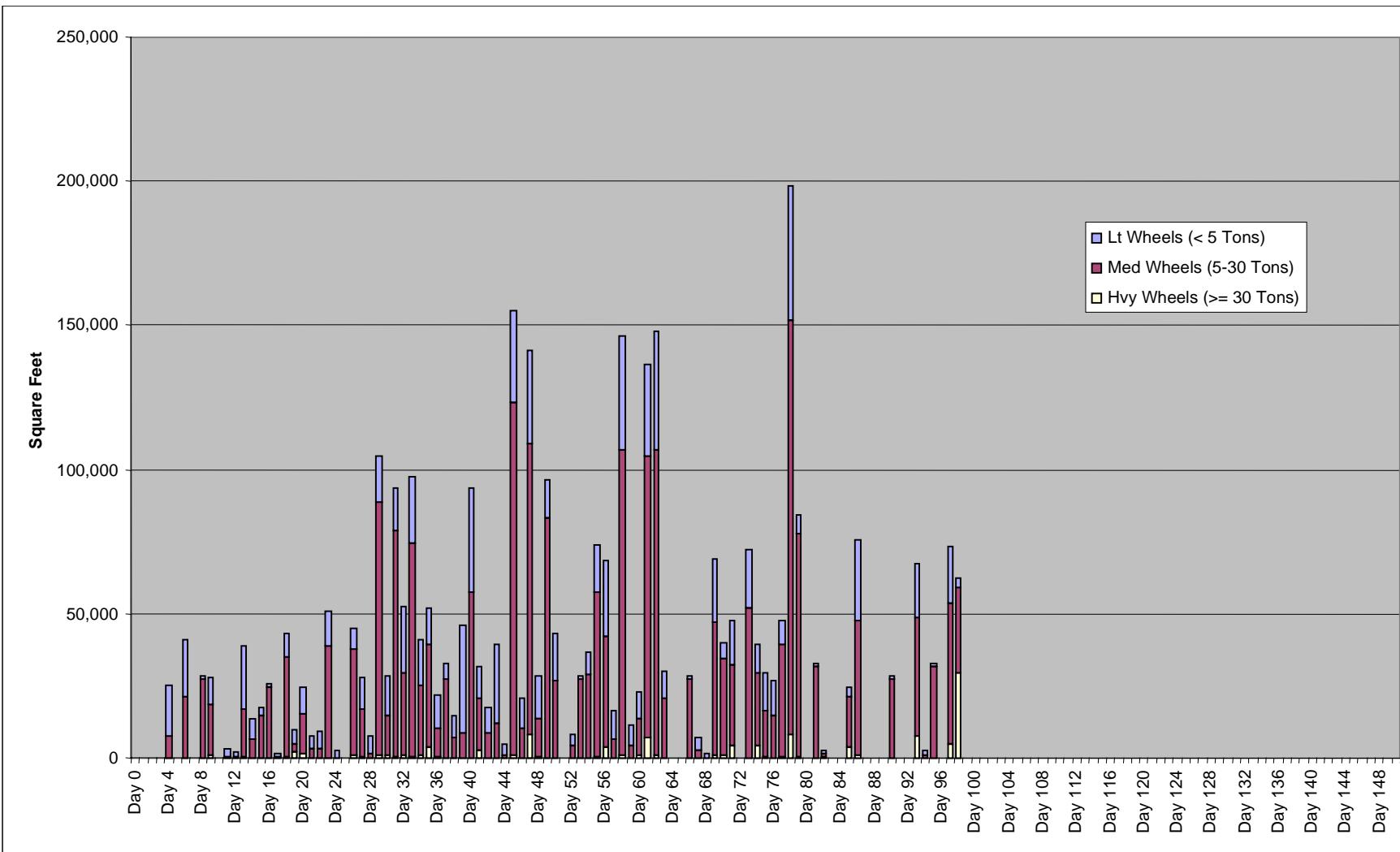


Figure B-15. Square Feet of Wheeled Vehicles Arriving at the Port of Tacoma

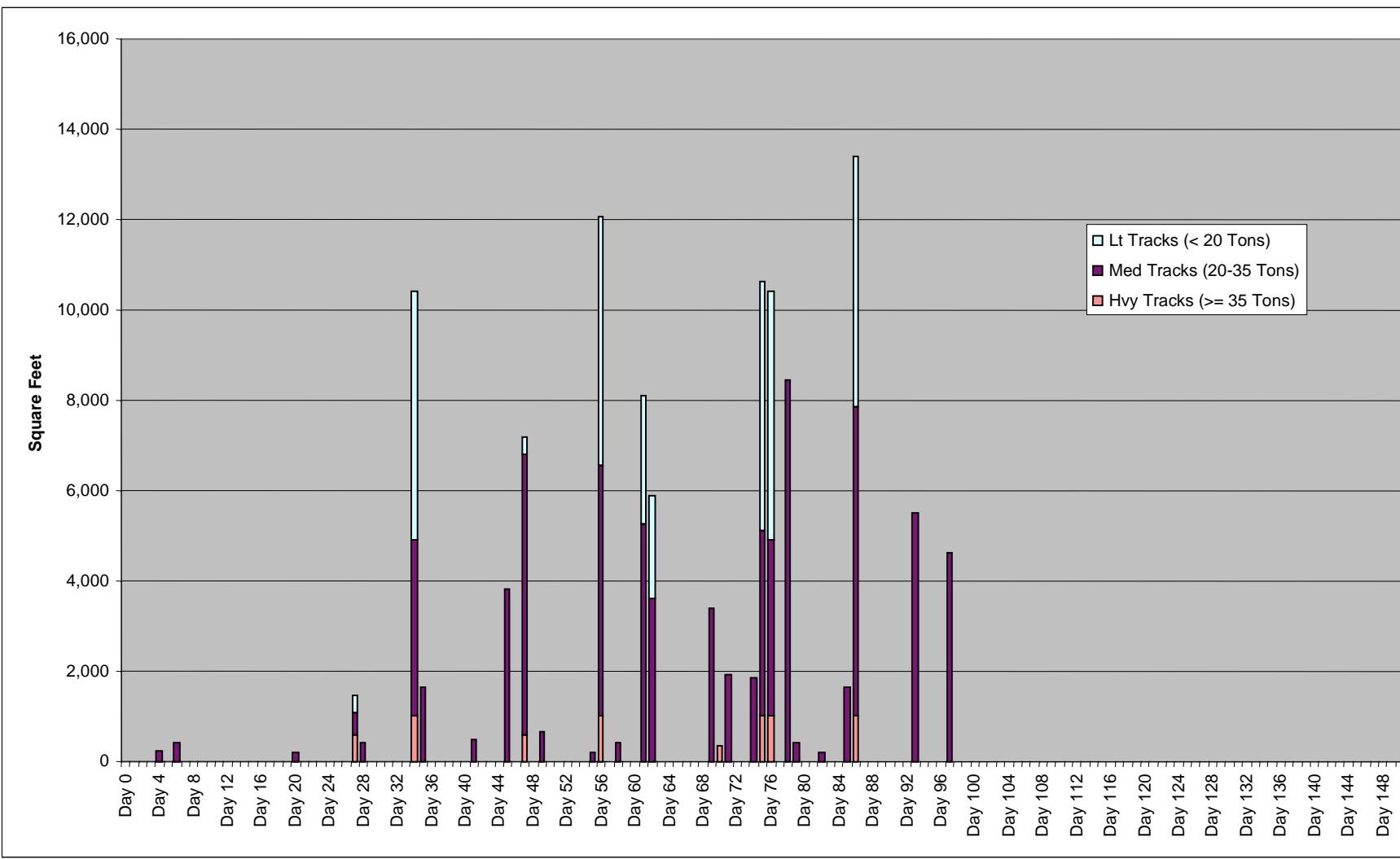
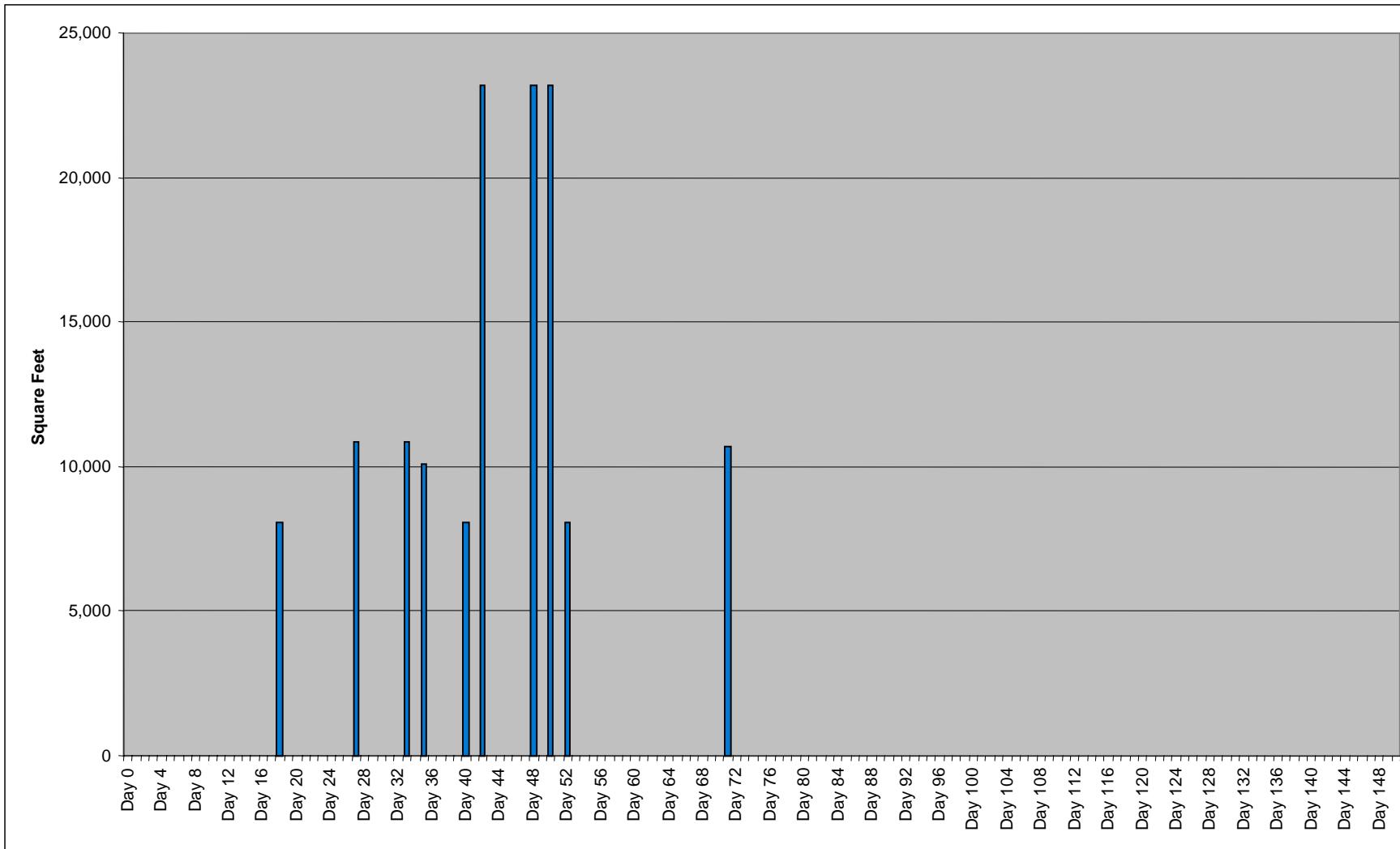


Figure B-16. Square Feet of Tracked Vehicles Arriving at the Port of Tacoma



*Figure B-17. Square Feet of Aircraft Arriving at the Port of Tacoma*

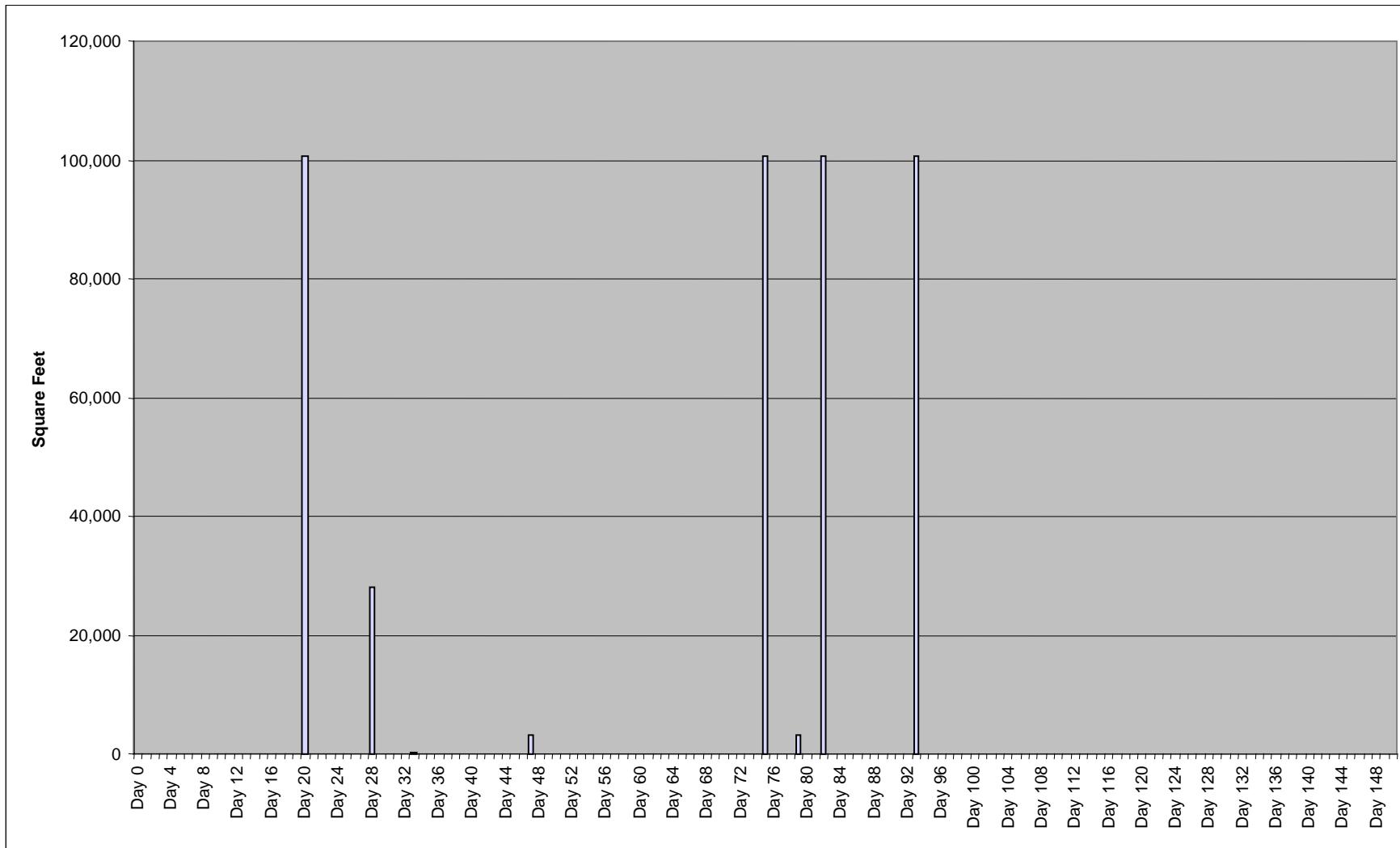


Figure B-18. Square Feet of Floating Craft Arriving at the Port of Tacoma

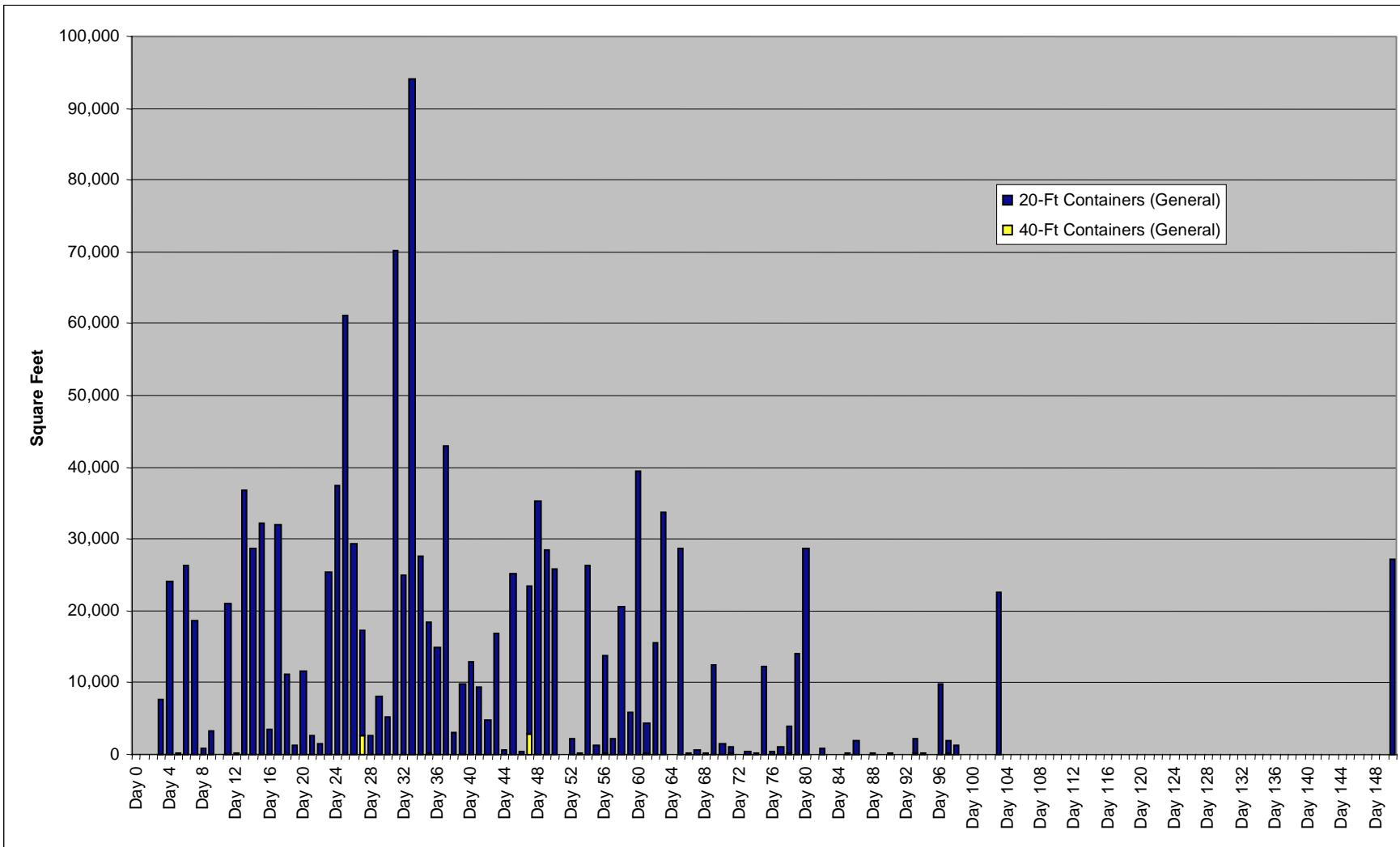


Figure B-19. Square Feet of Containers Arriving at the Port of Tacoma

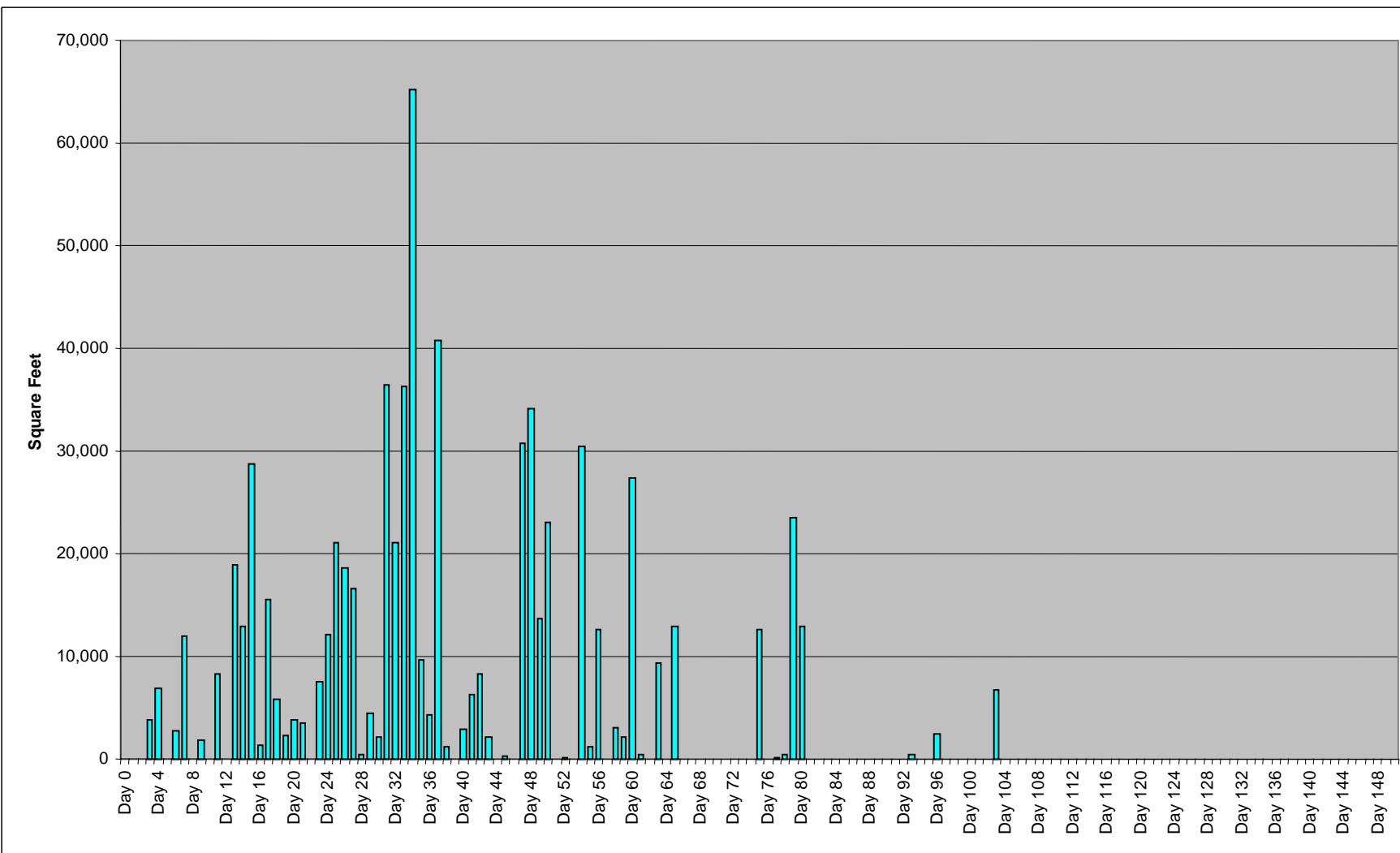


Figure B-20. Square Feet of Breakbulk Cargo Arriving at the Port of Tacoma

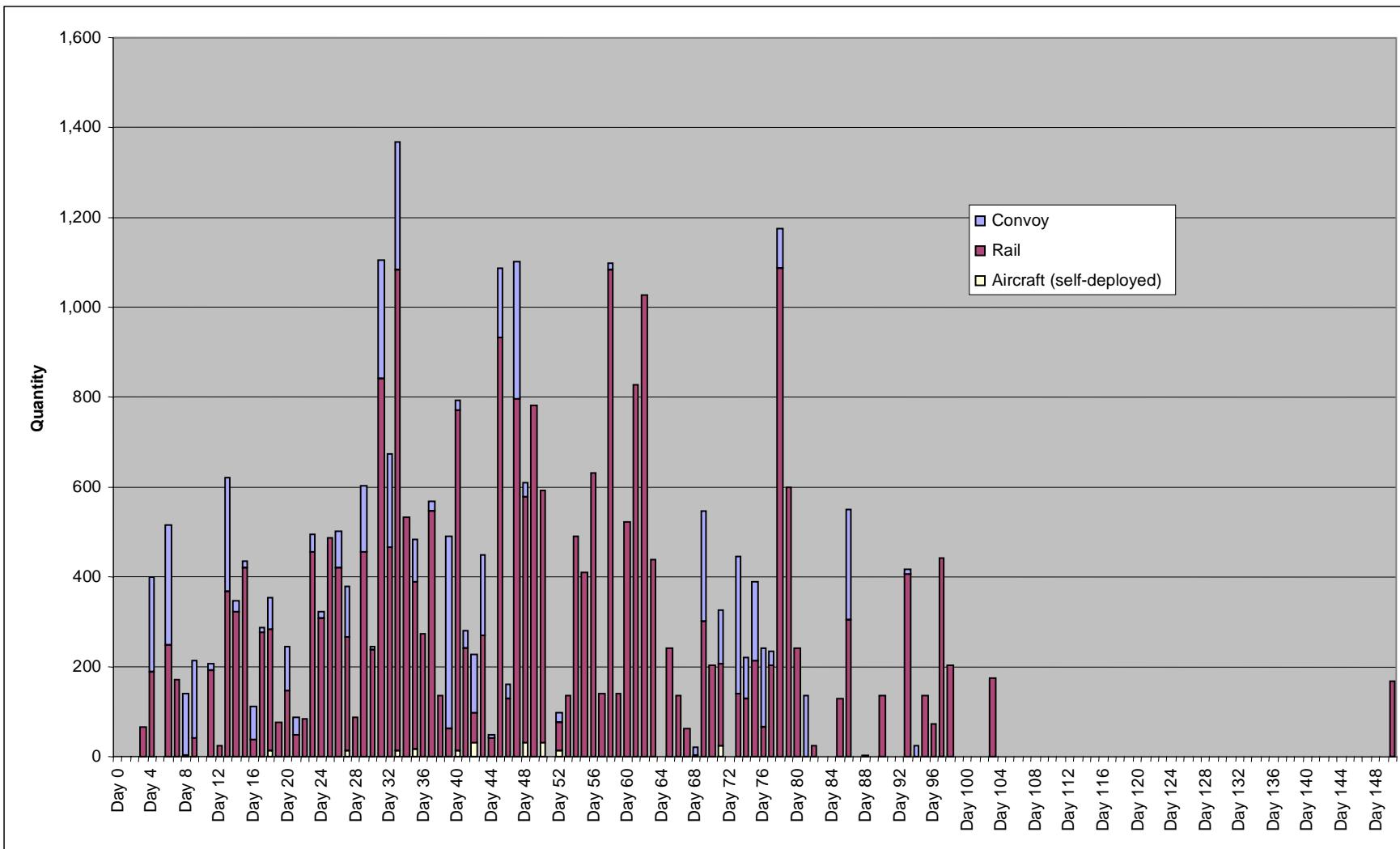


Figure B-21. Quantity of Cargo Items Arriving by Mode to the Port of Tacoma

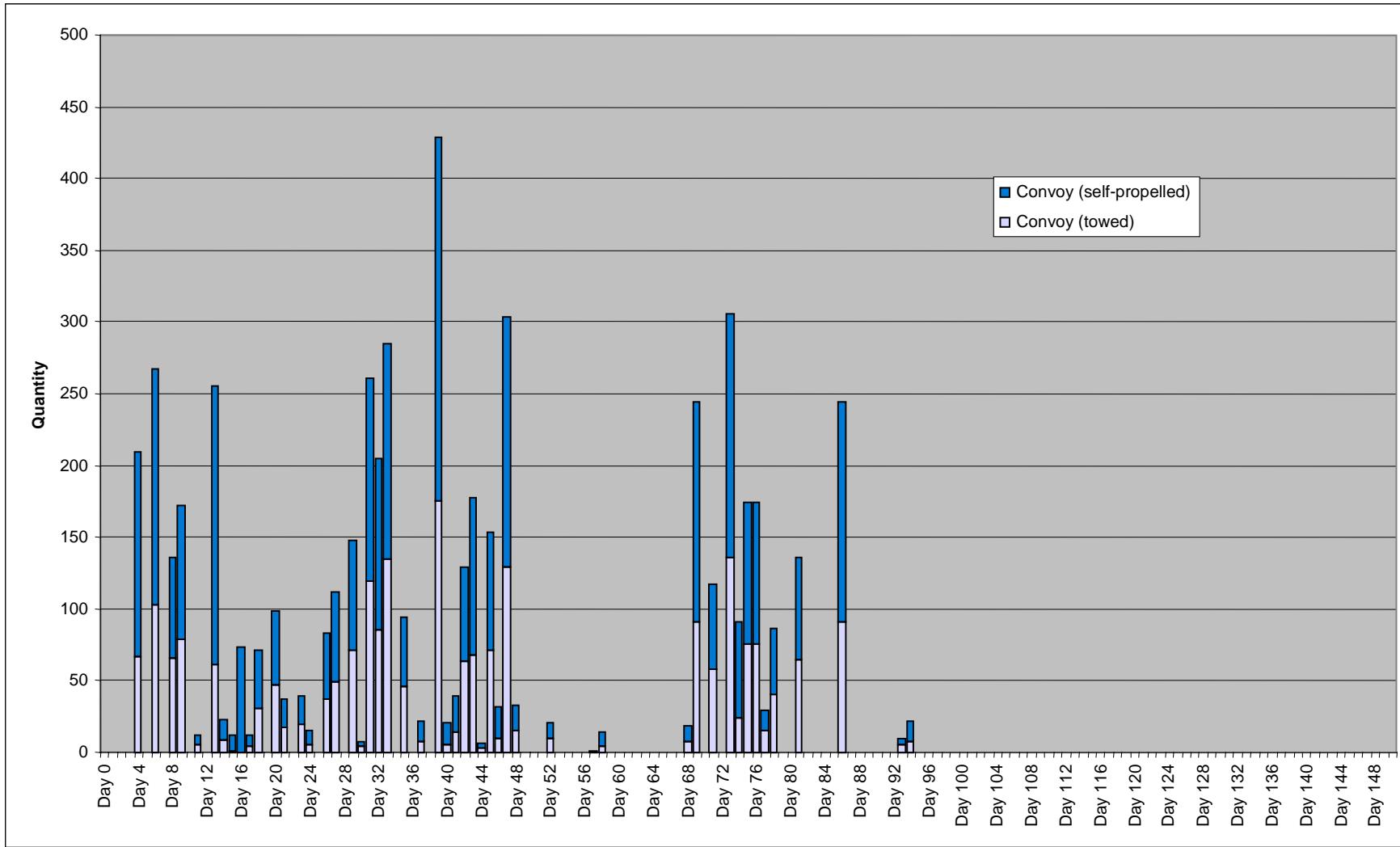


Figure B-22. Quantity of Wheeled Vehicles Convoying to the Port of Tacoma

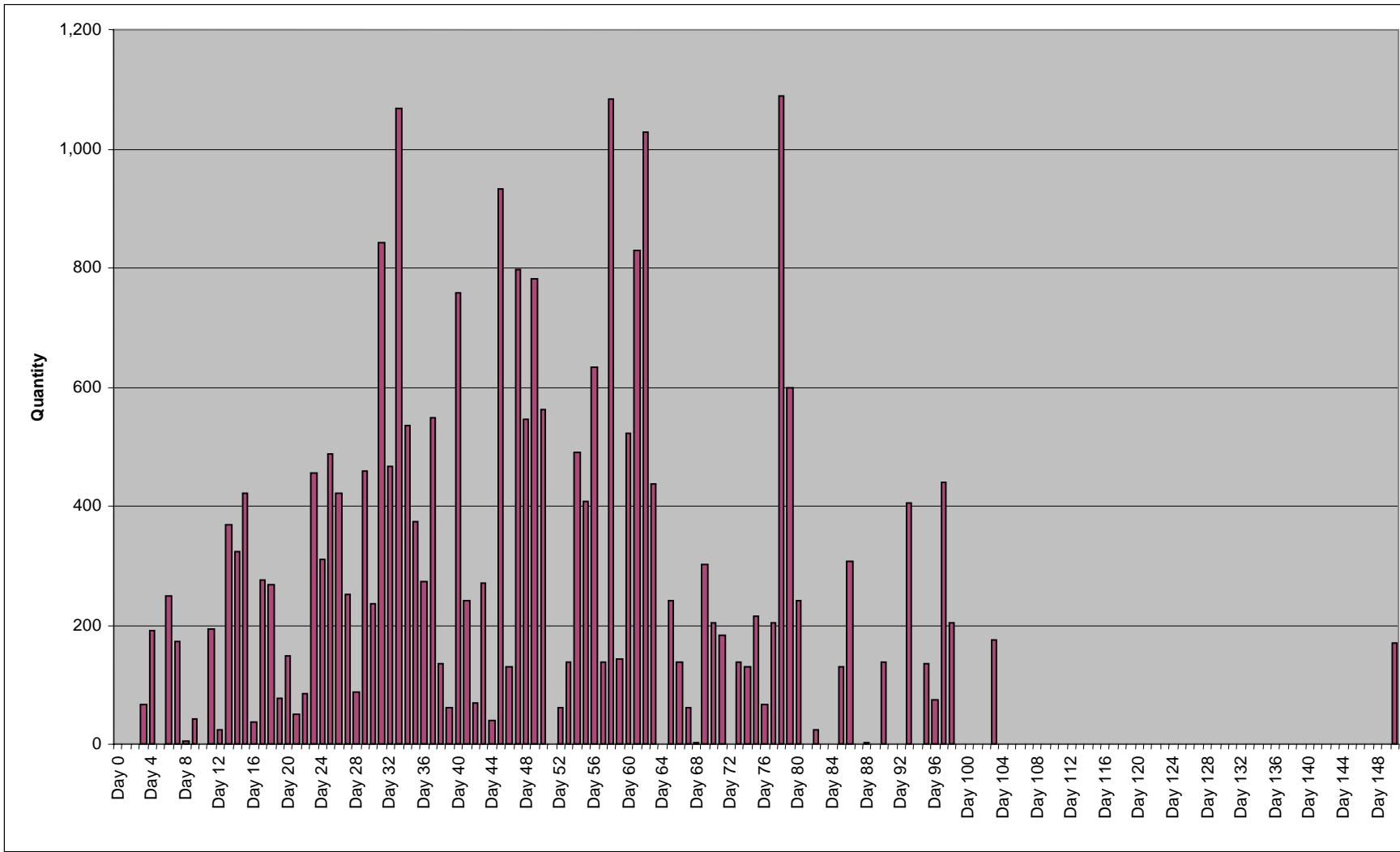
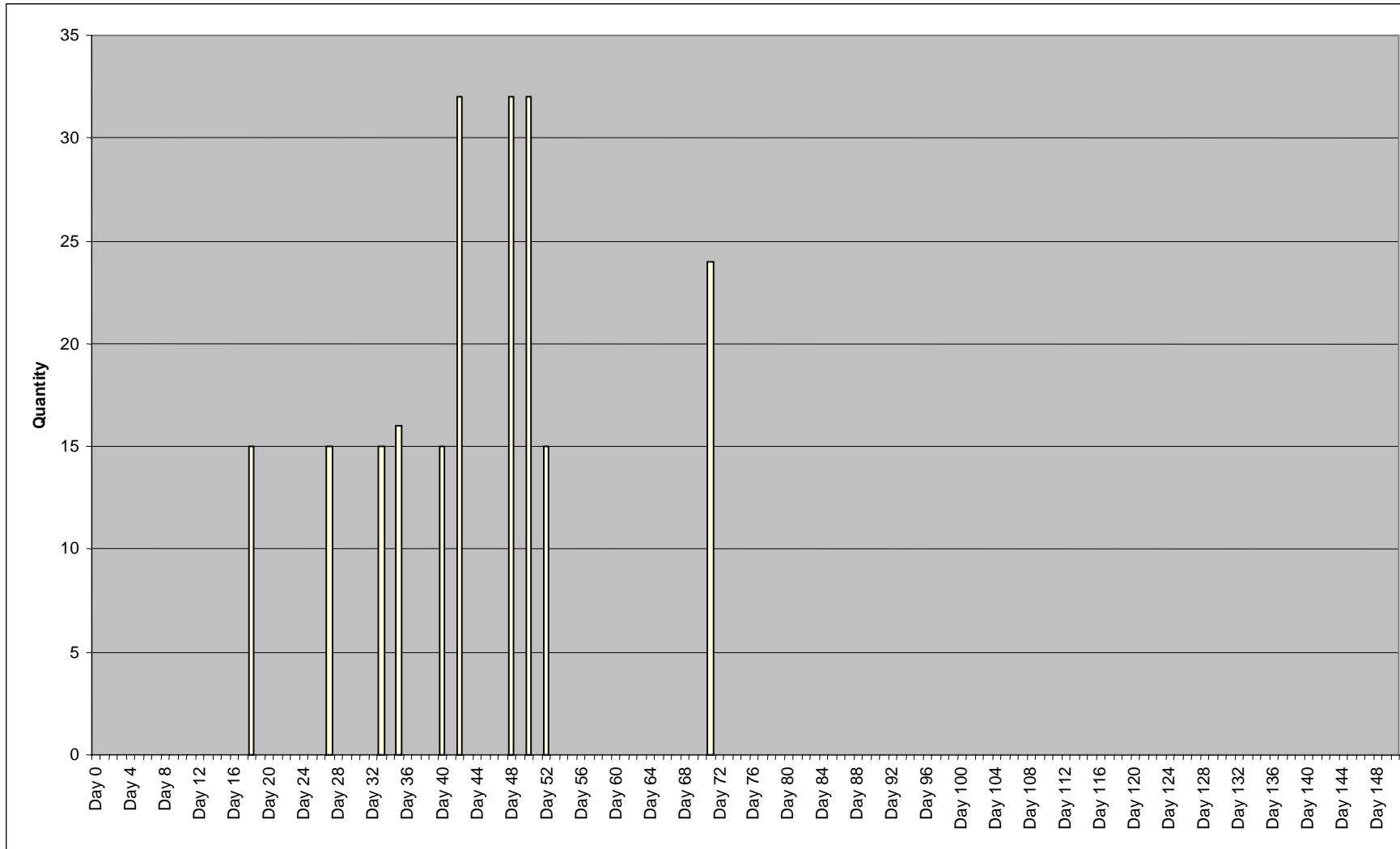


Figure B-23. Quantity of Items Arriving by Rail to the Port of Tacoma



*Figure B-24. Quantity of Aircraft Self-Deploying to the Port of Tacoma*

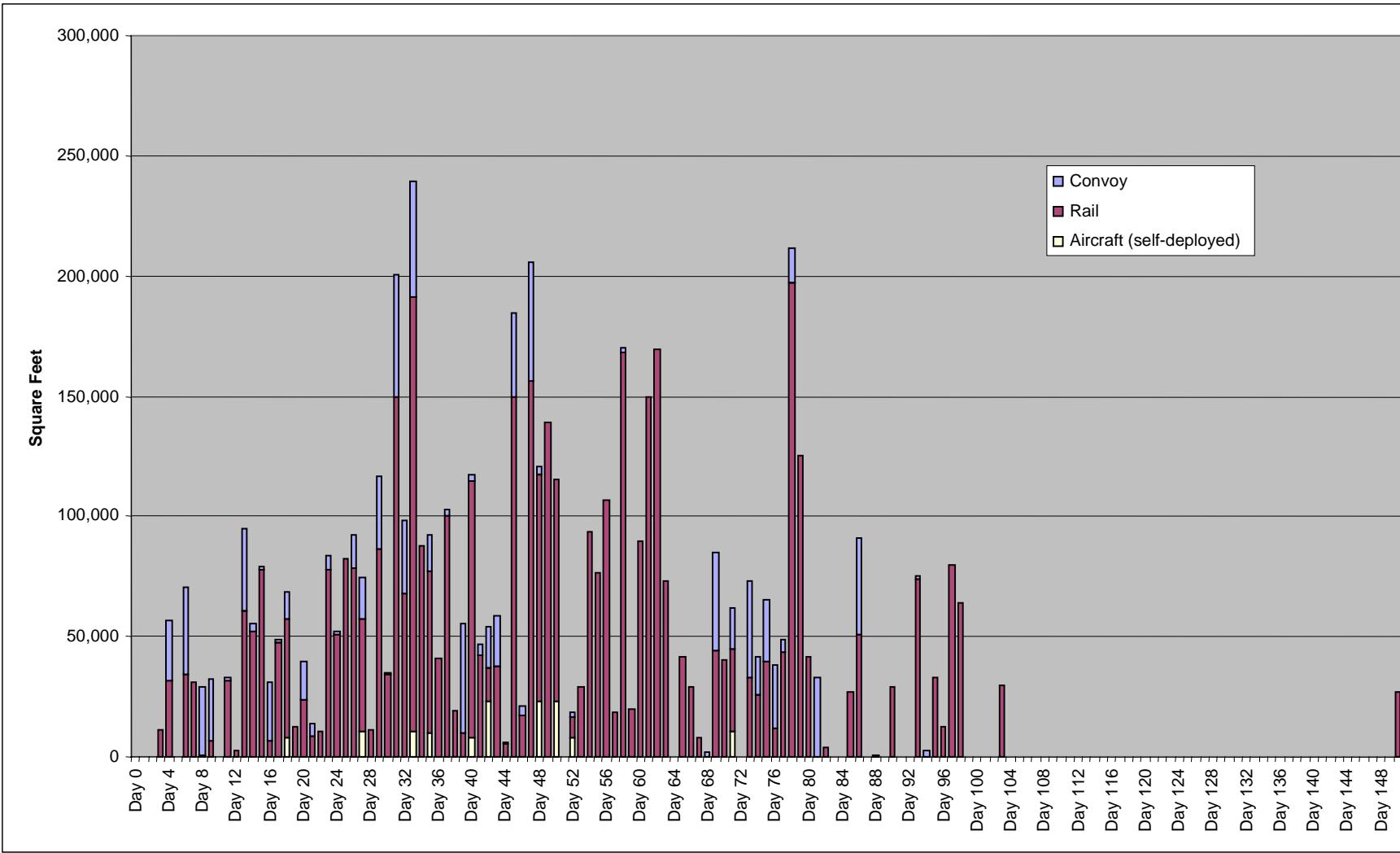
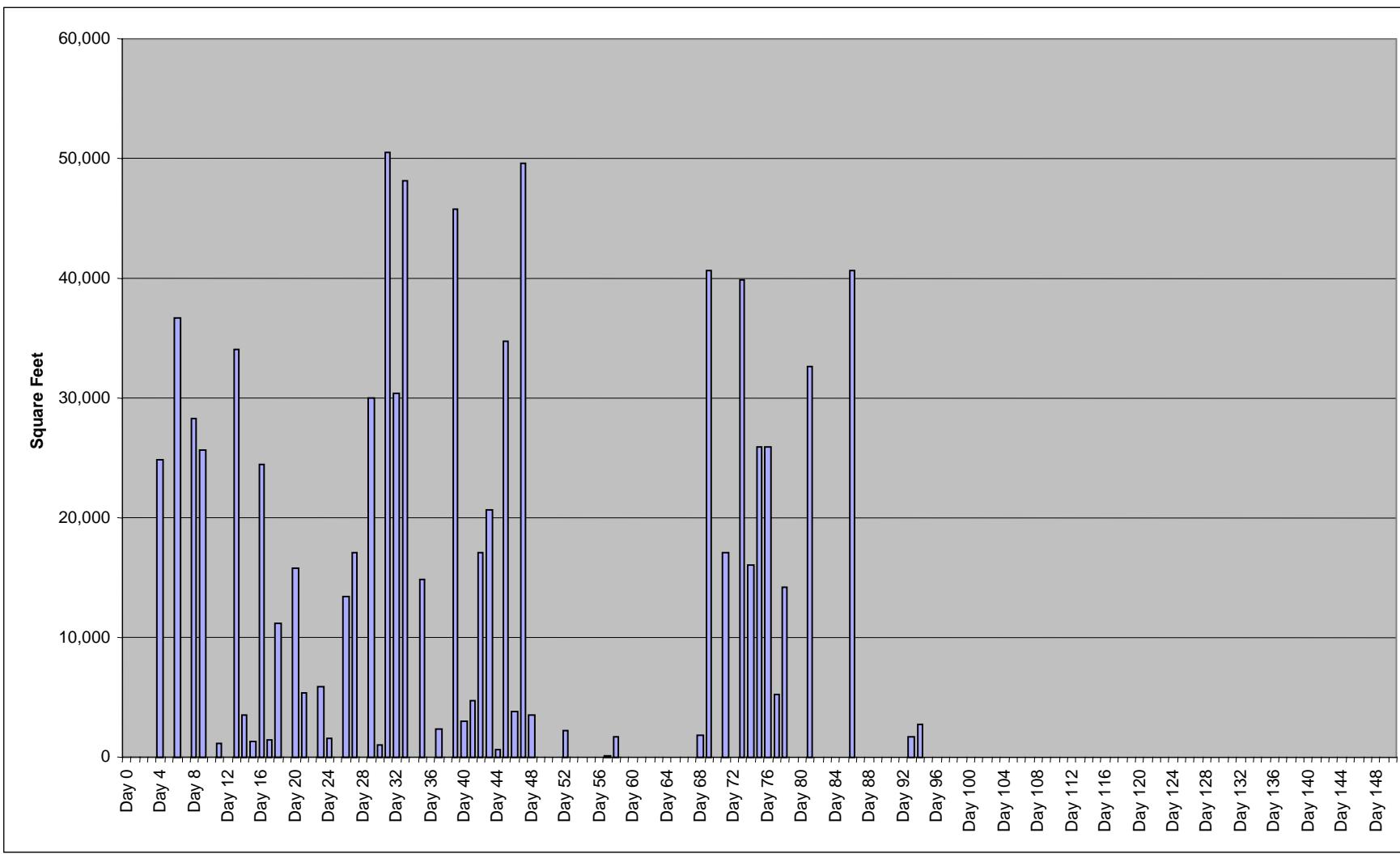


Figure B-25. Square Feet of Cargo Arriving by Mode to the Port of Tacoma



*Figure B-26. Square Feet of Wheeled Vehicles Convoying to the Port of Tacoma*

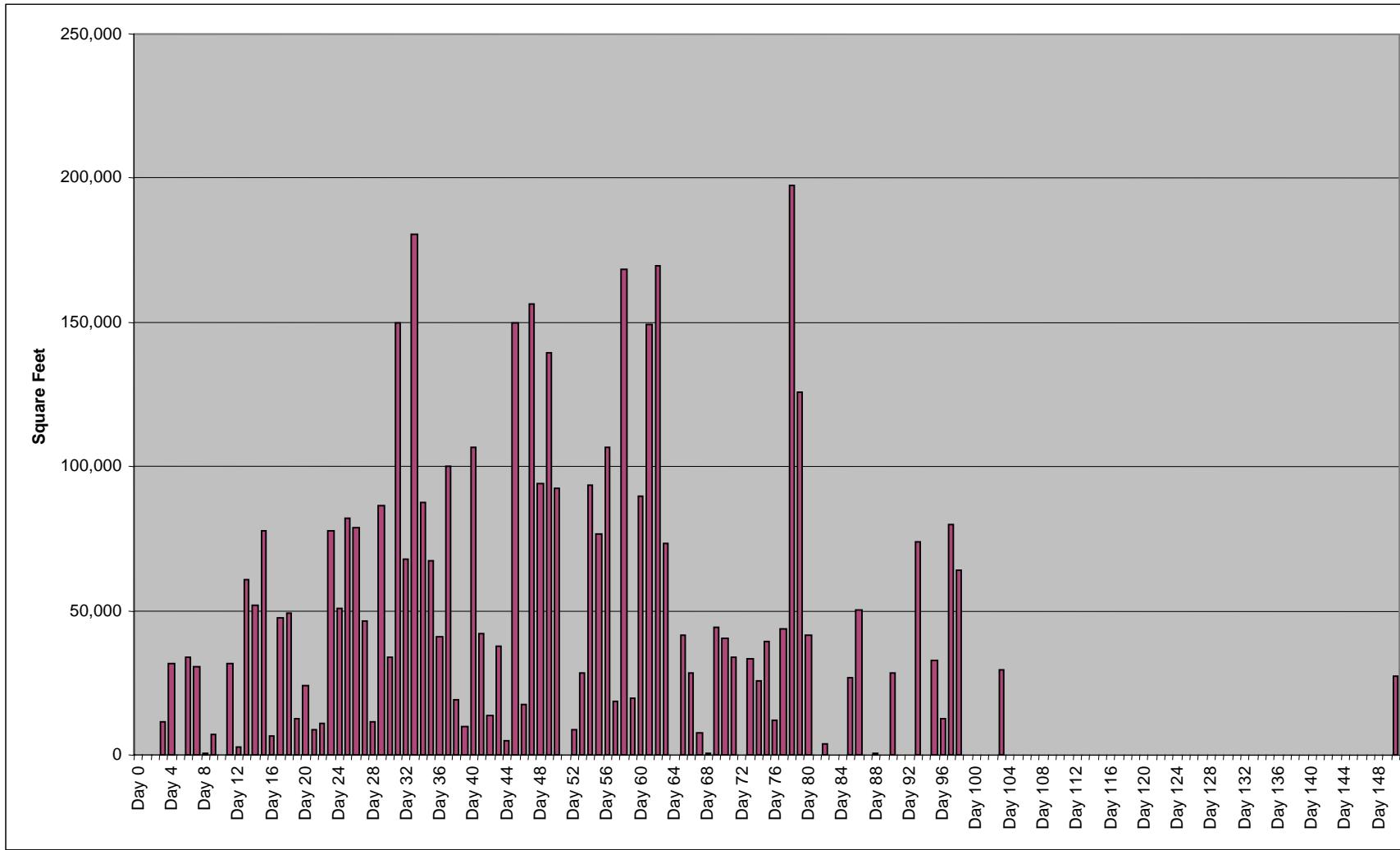
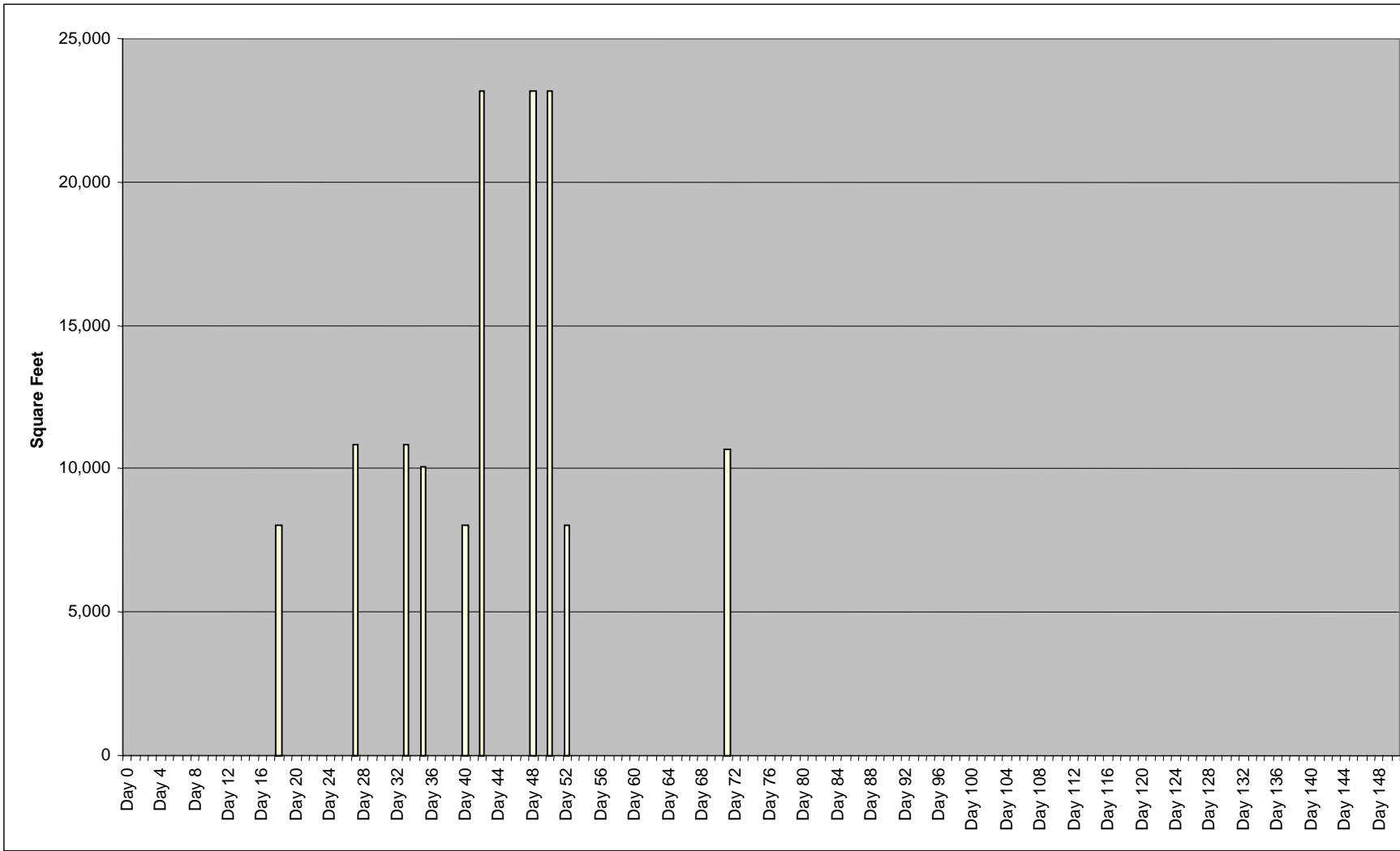


Figure B-27. Square Feet of Cargo Arriving by Rail to the Port of Tacoma



*Figure B-28. Square Feet of Aircraft Self-Deploying to the Port of Tacoma*

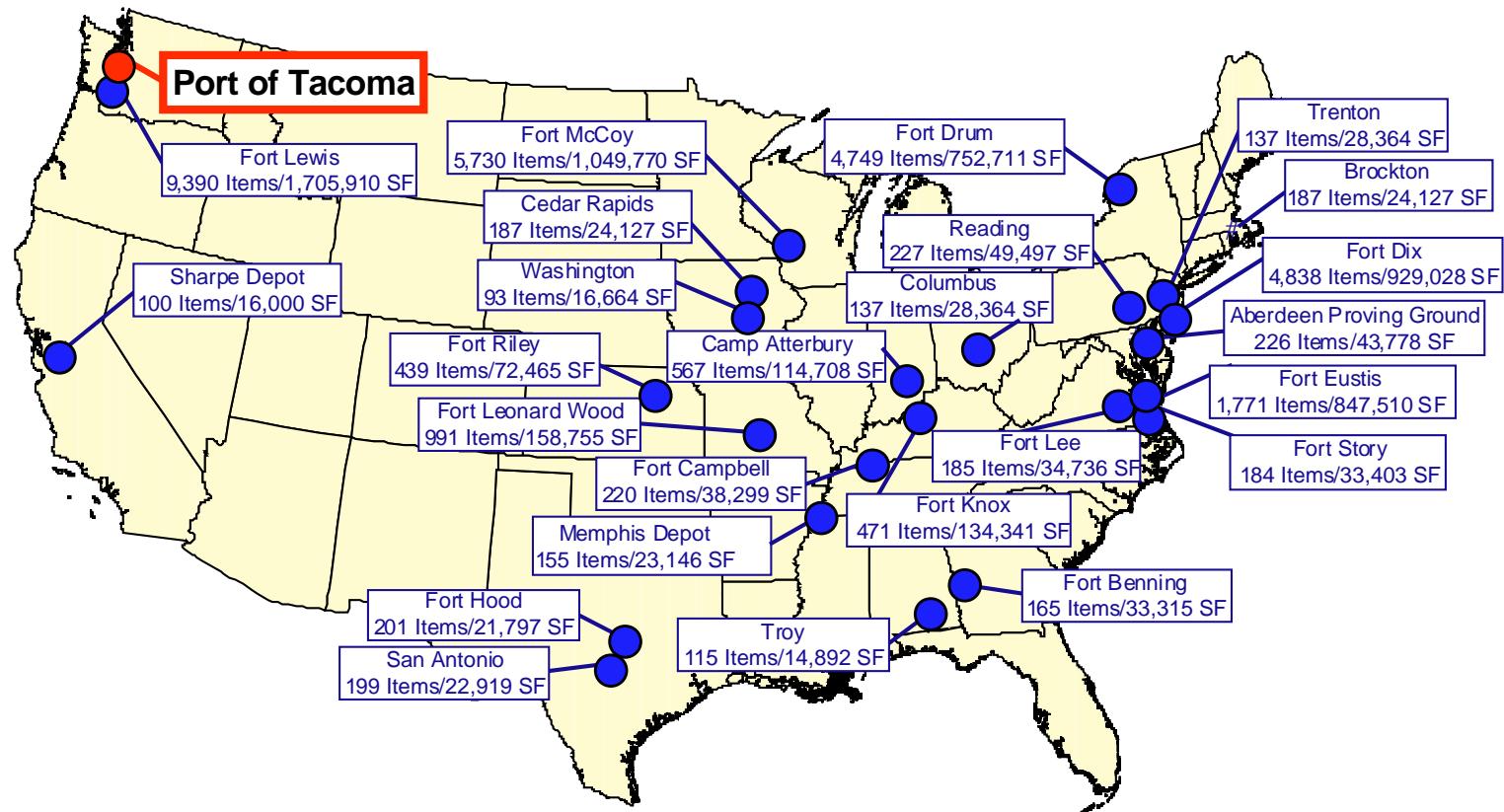


Figure B-29. Amount of Cargo Arriving at the Port of Tacoma by Origin

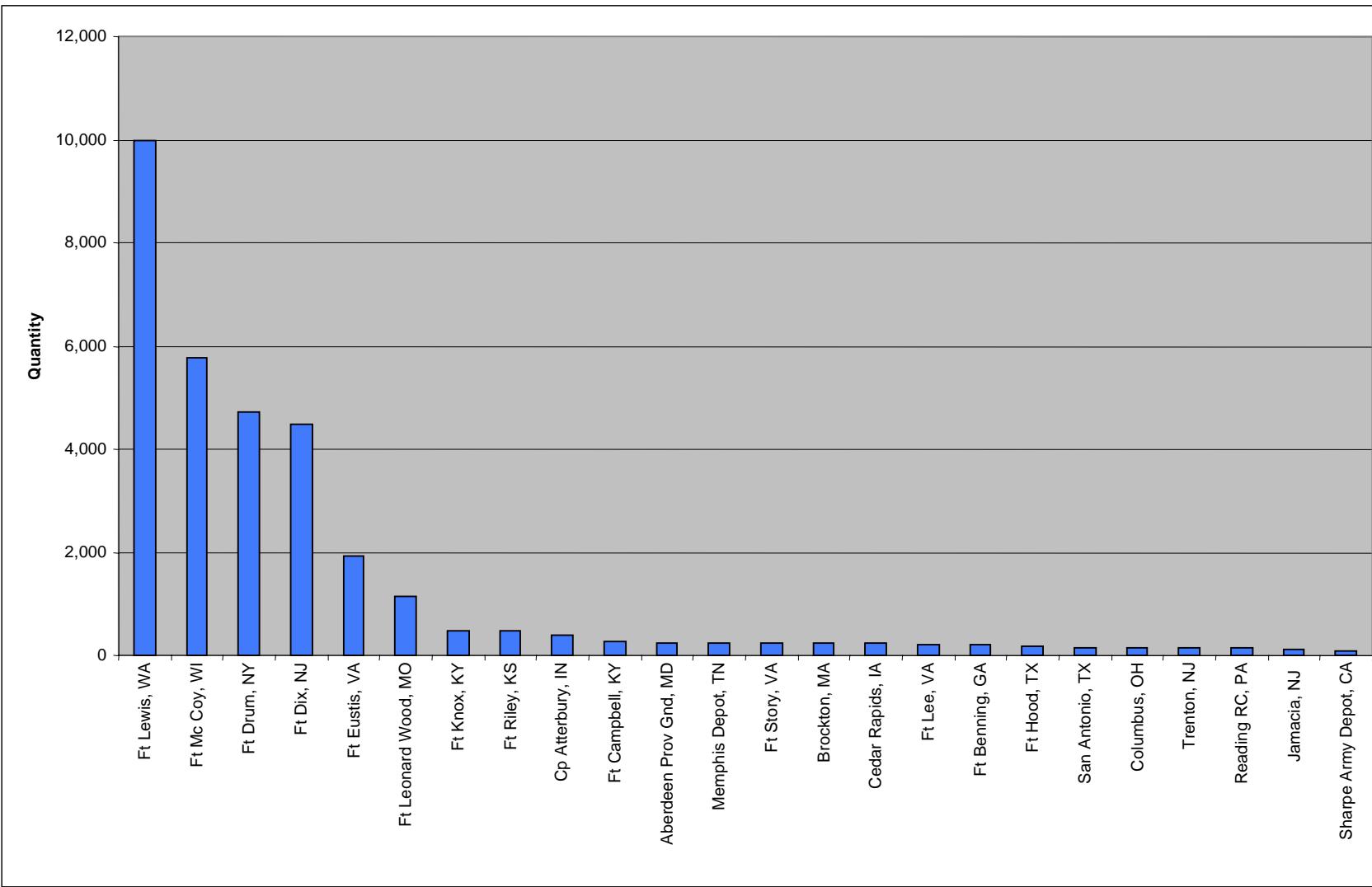


Figure B-30. Quantity of Items Arriving at the Port of Tacoma by Origin

**Table B-1**  
**Quantity of Items Arriving at the Port of Tacoma by Origin**  
**(Origins not in Figure B-30)**

Origin	Quantity
Troy, AL	96
Washington, IA	96
Fort Carson, CO	91
Davenport, IA	87
Camp Murray, WA	74
Kansas City, KS	46
Camp Ripley, MN	42
New Cumberland Depot, PA	36
Chicago, IL	35
Anniston Army Depot, AL	34
Fort Lawton, WA	23
Independence, MO	23
Selfridge ANGB, MI	23
Tooele Army Depot, UT	23
Yakima Firing Center, WA	23
Fort Detrick, MD	14
Little Creek, VA	12
Salt Lake City, UT	5

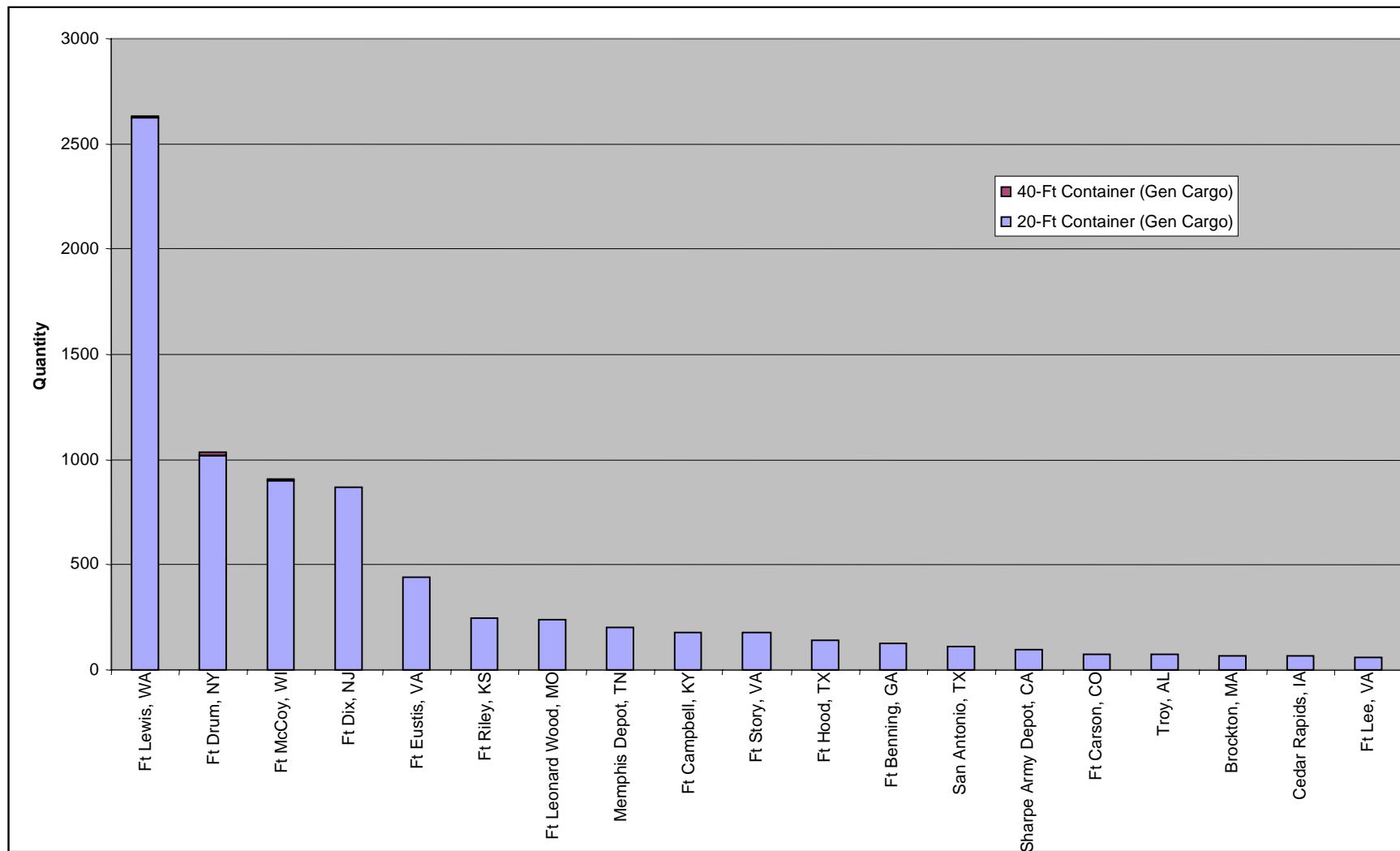


Figure B-31. Quantity of Containers Arriving at the Port of Tacoma by Origin

**Table B-2**  
**Quantity of Containers Arriving at the Port of Tacoma by Origin**  
**(Origins not in Figure B-31)**

<b>Origin</b>	<b>20-Ft Containers</b>	<b>40-Ft Containers</b>
<b>Fort Knox, KY</b>	<b>2</b>	
<b>New Cumberland Depot, PA</b>	<b>2</b>	
<b>Anniston Army Depot, AL</b>	<b>2</b>	
<b>Aberdeen Proving Ground, MD</b>	<b>0</b>	<b>1</b>

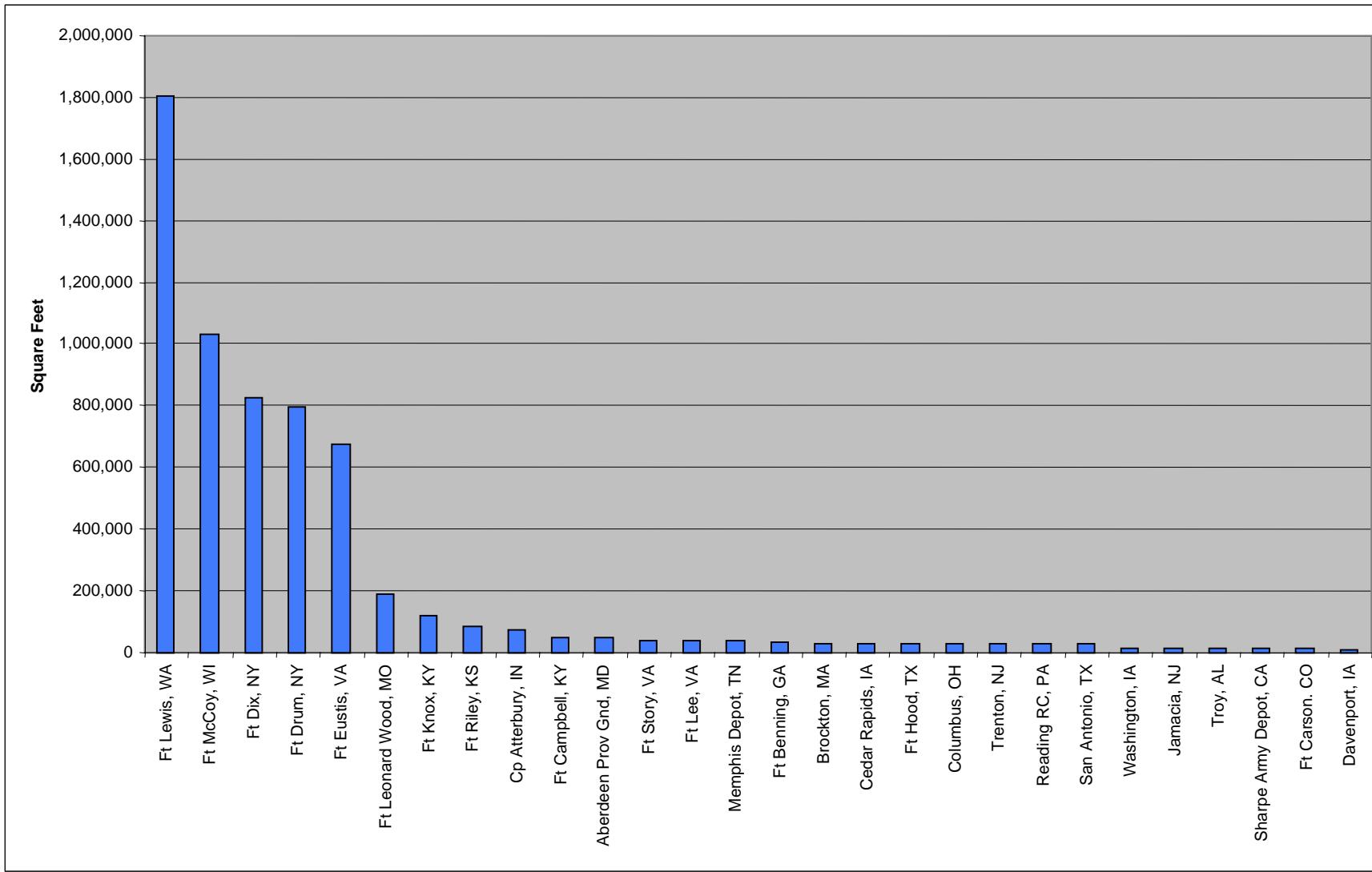


Figure B-32. Square Feet of Cargo Arriving at the Port of Tacoma by Origin

**Table B-3**  
**Square Feet of Cargo Arriving at the Port of Tacoma by Origin**  
**(Origins not in Figure B-32)**

Origin	Square Feet
Camp Murray, WA	9475.2
New Cumberland Depot, PA	5760.0
Anniston Army Depot, AL	5440.0
Kansas City, KS	5290.6
Chicago, IL	4577.0
Camp Ripley, MN	4339.4
Fort Lawton, WA	3965.3
Independence, MO	3965.3
Selfridge ANGB, MI	2536.9
Tooele Army Depot, UT	2536.9
Yakima Firing Center, WA	2536.9
Fort Detrick, MD	2253.8
Salt Lake City, UT	727.1
Little Creek, VA	297.0